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The Engineering and Mining Journal

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The Situation in Mexico

The situation at present existing in Mexico is of a nature to reduce the mining industry to low terms, it being possible to operate mines and conduct business otherwise only in such parts of the country as have been unaffected by disorder and violence, and such parts are not many. Brains are puzzled to determine what steps to restore order out of this chaos can and ought to be taken. Years ago there was a common expression of wonder as to what would happen in Mexico after Diaz had gone. The answer is now before us and Diaz himself lives to read it.

Diaz, in the early days of his administration, appreciated that the prosperity of Mexico depended upon the establishment of order, and appreciating moreover that his people were not sufficiently enlightened to distinguish between liberty and license, he put the fear of the law into them by arbitrary, and even high-handed measures. These were often harsh and bloody; yet they were necessary, because how could business be conducted except in peace? What was the use of anybody operating a mine if his bullion were likely to be stolen on the way to the express office? How could mines be successfully operated if their managers ran the risk of assasination every time they went to and fro?

Assasination, highway robbery and brigandage were rooted out by the strong arm of Diaz and his corps of *rurales*, and it became possible to conduct business even in remote parts of Mexico with almost as much security as in the United States. For this Mexico owed a debt of gratitude to its great administrator. It is unfortunate that his officials introduced grafting that imposed too great burdens upon the people and led to the revolution, resulting in the ousting of Diaz and the substitution of Madero.

Whatever be the faults of Madero, it is evident that he has not had a fair chance, not having had sufficient time, and having been entangled from the outset by a series of rebellious disturbances. It is evident, moreover, that Zapata, Orozco and the others have not been in the field for any sincere purpose, but rather out of pique or for objects of personal gain. Since the dispersion of Orozco's main army the situation in the northern part of Mexico has been one of magnified brigandage, nothing else.

Such brigandage existed in Mexico in a way in the early days of Diaz's administration. Even then there were bold spirits, like Heraclio Bernal, in Durango, who, taking to the road, collected a band of two or three hundred around him, robbing wayfarers, raiding *haciendas* and occasionally taking a town. Bernal, who possessed a sense of humor, used to give receipts for property appropriated, his receipts being redeemable "when he became governor of Durango." Even in those days the dividing line between a leader of the political opposition and the professional bandit was uncertain. The government characterized every political opponent as a bandit, while the professional bandit called himself a leader of the political opposition. Diaz, however, put a stop to all that, and whether he was unconstitutional, dictatorial, autocratic or not, anyway he established order and made it possible for orderly persons to do business.

We see in Mexico at the present time a recurrence of the old evil, but greatly magnified. Instead of there being brigands here and there, we now see them almost everywhere. To refer to these gentry as "rebels" or "revolutionists" confers undue dignity upon them. They will continue to rob towns, mines and *haciendas* as long as they can. Out of fear they have heretofore pretty well let alone American and other foreign property, but recently they have become bolder and bolder in their threats against

the mining camps and have raided more and more of them.

The operation of these plunderers has been retarded very properly by the embargo of the American Government upon the shipment of arms and ammunitions to them. The Mexican government is, however, too weak to control them. The present situation in Mexico is not very different from what it was in Arizona and New Mexico 30 years ago, when the Apaches were loose. The same methods will apparently now have to be applied in Mexico as then, but will the Mexican government be able to do it? In the meanwhile, Mexico is a disagreeable and dangerous country in which to live and its mining industry is seriously checked.

An Experiment in Technical Education

The Colorado School of Mines has inaugurated a novel experiment in technical education by the establishment of an experimental ore dressing and metallurgical plant, which in effect is a complete commercial mill. Into this the boys are to be turned to acquire that familiarity with practical work that is so prominently in the minds of most of our technical educators. The means of accomplishing this are various.

Freiberg and Clausthal supplemented the instruction of the lecture room with work in the laboratory and a required service in the mines and smelteries of the vicinity. The first mining schools in this country—in Boston and New York, remote from mining districts—introduced the then novel expedient of model laboratories in which the form of ore treatment was followed, if not the substance, and the students were sent on travels to see the real thing. Golden is the first to have the real thing in its own domain.

The weakness of the system of sending immature young men out upon inspection trips, from which they cannot by any possibility profit much, is recognized. The importance of putting young men into real work is also recognized. As the young man goes into real work as an employee with the feature prominently in his mind that not only must he do useful things, but also that his pay depends upon the intelligence and fidelity with which he does them, there is introduced the feeling of responsibility which is the most important thing in human development. Whether that can be inspired in the plant of the Colorado School of Mines remains to be seen.

Anyway, this experimental plant will, without doubt, be useful in the determination of much data that are needed, such as the efficiency of means of crushing ore, the relative capacity and efficiency of various screens, the advantages and disadvantages of many details of mill construction, etc. Data of this kind are sadly lacking in engineering literature and practice. It is possible that the educational services of the new department of the Colorado School of Mines may be of more consequence to the profession and industry in general, than to its own students.

Gold Production in 1912

There has been a good deal of discussion recently in the public prints on the question whether the increase in gold production which has been so marked in the last decade is going to continue. Most of this has been in connection with the assumption that the purchasing power of gold has decreased and that the higher prices which prevail over a large part of the commercial world are in part the result of the cheapening of the standard. This is a complicated question with which we have no space to deal here, beyond saying briefly that the assumption mentioned is, we believe, not justified by the facts, at least to the extent which some economists think.

Whether the production of gold in the world has reached its maximum for the present or not is a question which is also of considerable difficulty. There are indications which point both ways, and it is not altogether easy to balance them. Nor is it safe to look too far into the future without seriously endangering one's reputation as a prophet. A good authority has recently ventured the prediction that production will decline, but his argument involves certain assumptions which not everyone will be willing to accept.

We can, however, to take up only a small part of the subject, put together some facts which cover the production of the present year—three-quarters of which have now passed—and these seem to indicate that the gold output of 1912 will not greatly exceed—if it exceeds at all—that of 1911. Without exact data from most of the larger producers, there are, nevertheless, sufficient facts known to point to this conclusion. The largest and most important producer at the present time is the Transvaal, and that country is showing an increase this year from which the world's gain must come, if it comes at all. In the United States such returns as we have point to an output which will not vary greatly from that of 1911, and may be below it. No other producer from which any returns are to be had shows any increase, with the exception of West Africa, the contribution from which is small. On the other hand, the Australian mines are emphasizing this year the decrease which has been going on for several years past. The fragmentary returns from Russia indicate that labor scarcity and labor troubles have combined to reduce activity at the Siberian mines, while in the Urals there has been a large transfer of miners from the gold mines to the more profitable pursuit of platinum. In Mexico the unsettled state of the country has seriously interfered with mining. Rhodesia has failed to show the gain which was hopefully anticipated. South America is at a standstill, and no other country has developed any new sources of supply. No notable discoveries have been recorded anywhere.

Upon the whole the present presumption is that the gold production of 1912 is not going to differ much from that of 1911. As already indicated the difference will depend entirely upon the amount of increase in the Transvaal and whether the gains there will more than counterbalance losses elsewhere.

The present activity of the steel trade has started again the construction of new works and extensions of existing plants. Since 1908, not much has been done in this line, except to complete the enterprises started during the boom of 1906-7. At present, however, there are plants under construction or contract which will increase the total steel-making capacity by something over 2,000,000 tons yearly. All the new steel works use openhearth furnaces, so that the converter will continue to lose in comparative importance, as it has been doing for several years. In addition to the increase noted above, much new work is projected, but has not yet reached the stage of actual construction.

By the Way

The general manager glanced casually at the graduate. "I have no position to offer you," he said. "You misunderstand," responded the graduate. "What I want is a job." Two minutes later he was at work.

A mining engineer recently returned to the copper country of Michigan and brought with him a sample of copper ore from Arizona. One evening while visiting with some friends a Cornish miner was examining the sample and the following conversation took place: "What per cent. would 'e run?" "About twelve per cent.," said the mining engineer. "Goes 'ome—'e wouldn't run twelve per cent. if 'e was all copper. 'E 'edn't heavy enough."

We have just read an article on junk smelting which says that the insulation is burned off scrap wire, after which it is "simply remelted, poled, and cast again into wire, or into ingots or bars for redrawing." Some of our wire-mill friends will doubtless favor us with their reasons for preferring ingots for drawing purposes, or better, some of the junk men had better tell us more about casting wire, and we will then put the drawers out of business.

The good prices for the metals are not only increasing the prosperity of the individual mining companies, but have also begun to penetrate as far as the holding companies. Anaconda has increased its dividend from 8 to 12%, and it is expected that this increase will be reflected in the next dividend of the Amalgamated. The United States Smelting, Refining & Mining Co. has also increased the dividend on its common shares by 25c., paying 75c. per share for the third quarter, with the customary 87½c. on the preferred shares, and the Old Dominion holding company is now on a 16% basis.

Prof. H. S. Munroe tells of the examination, some years ago, of a gold-silver property, where the samples were taken, placed in bags and the bags carefully sealed before loading them on the cage to be delivered at the assay office. As an extra precaution a supply of ashes from the company's boilers was taken into the workings without the knowledge of the management. Every now and then a sealed bag of ashes was sent up with the samples. The ashes and the ore were assayed side by side with the result that Professor Munroe advised his clients that if they must have a mine, his assays showed that they could do no better than to purchase the mine that produced the coal used by this particular company, for in addition to being a good coal mine it appeared to be a surprisingly good gold-silver property.

After 11 years of underground work, fortune has smiled on a miner. His success, however, was not obtained in a rich pay streak, but in discovering that he had a "tenor voice of exceptional promise." At least that's the way his London press agent has put it, in announcing that Manager Dippel, of the Chicago-Metropolitan Opera Co., has engaged Morgan Kingston to sing with that organization for a number of years, beginning October, 1913. Kingston, it is reported, began work in a Nottinghamshire mine when 11 years old. One day, about three years ago, the manager of the mine, who had heard him sing, brought a friend down to hear him, with the result that Kingston later went to London to study.

An unusual court case was recently tried in Ishpeming, Mich., as a result of which Isaac Risku, a miner, was ordered by the judge to pay $2 in fines and about $12 in costs, because he forced John Karhn, a trammer, away from the place where he (the miner) was preparing to blast underground. Karhn and his partner were finishing loading a car, when Risku ordered him away. As the trammer did not move from the place as quickly as the miner desired, the latter grabbed him by the neck and menaced him with a crowbar. The judge held that, as the shift boss was but three minutes' walk away, the miner should have notified him when the trammer would not move, rather than take the law into his own hands and assault the trammer in the manner complained of. The trammer claimed that the danger from the blast was not so immediate as to cause the miner to act as he did. The miner intended to appeal the case to the circuit court, but meantime the mining company took a hand and discharged the trammer, so that he likely will not be in the county when the case is called. It may be that this dispute came about because the shift boss had not minded the famous advice of a certain old mining captain who contended that, "in placing your men, never put two of different smells in the same working."

Under the title, "Where Tungsten Comes From," the *Literary Digest* tells us that but a short time ago the average citizen could not tell whether tungsten was a patent medicine or the name of a manufacturer. With this kind of a set-up, it turns on the air and drills into the wonderful, so to speak, occurrence of the big "Tungsten Farm" in Colorado, quoting from the *Edison Monthly* as follows: "The supply of this Colorado 'tungsten farm' is practically inexhaustible. So vast is it in extent, so abundant and so easy to mine that the price of this valuable metal has gone down until it is available for widest commercial use. This 'farm' stretches for a great distance along a steep mountain side. The ore lies on it in great windrows, thousands, hundreds of thousands, perhaps millions of tons. As yet no one has attempted to calculate its extent. There is too much of it. Still more surprising, a great quantity of the ore is about 70% pure. Altogether it is probably the most remarkable deposit of this mineral in the world. Tungsten is usually found in veins from 60 to 100 ft. below the surface. Therefore, in some remote geological age this mountain side where the 'farm' now is was tilted by some mighty convulsion of the earth and the loose covering rolled and slid off the great ribs of black, heavy rock. Then, in the millions of years that followed, the action of the glaciers, the imperceptible but powerful touch of heat and cold, and the wash of the rains laid these mountain ribs bare. They were broken up and the fragments strewn in orderly confusion along their bases. At a distance it now looks like long piles of coal running up the mountain side with the same regularity as the windrows of tall grass that fall behind the scythe." From which one might gather that there is a "grand" opportunity for an intensive agriculturist on the big "tungsten farm."

A writer in the London *Mining Journal*, endeavoring to clarify mining nomenclature, presents the following paragraph: "Fissures are sometimes filled with angular débris of rock and clay, the result of the alteration of the 'country.' The Australian miner calls this 'mullock' (an old English word meaning rubbish or dirt), and he speaks of 'mullock veins,' or of a vein being 'mullocky.' The name was originally applied to the altered basalts of the deep 'leads' of Ballarat. 'Mullock' is, therefore, more or less synonymous with U. S. 'bluff' [It has been understood that this was a term used to describe American diplomacy, business methods, character or anything else particularly American—Ed.], but the use of the word has been extended to Australia, and is now synonymous with waste rock. Thus we have 'mullock-tip' (dump), and 'mullocker' (dumper). The application of the word to waste rock has very properly been objected to; but we need a word to describe a lode-filling consisting of altered country, and 'mullock' and 'bluff' might be retained for this purpose, thus corresponding to the *formación* or *carrancho* of Colombians, and *cascajo* of the Venezuelans. Besides 'waste' or 'waste rock' (Ger. *Berge*, Fr. *décombres*, Span. *escombros*) we can use the terms 'attle' and 'deads,' but 'rubbish,' 'refuse,' 'offcast,' 'trade,' and 'stuff' are not needed. Waste rock, however, should not be confounded, as it sometimes is, with waste used as packing—'attle-packing,' c.m., 'gob' or 'goaf' (Fr. *remblais* Ger. *Bergeversatz*, Span. *relleno*, It. *riempimento*)." This is now surprisingly clear. However, we still think that the necessity exists for an *Académie* to unify the English languages spoken in the so called English-speaking countries.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Geology Applied to Mine Examination

I have read with a great deal of interest the article by Ira B. Joralemon, in the JOURNAL of Aug. 10, 1912, as well as your editorial comment in the following number. Now it may have become the custom for the large copper companies, such as Mr. Joralemon represents, to require a tremendous amount of development, before they will examine a property, and to object to making a substantial payment when it does suit them, but this is not only rank heresy from the prospector's point of view, but it can be shown from the history of the company for which Mr. Joralemon works, that it is not always the most satisfactory and profitable method of doing a mining business; and if I were asked to supplement his needs of good judgment and breadth of vision, I should add one syllable only, viz.: nerve, which is more frequently lacking than all the other elements of success.

To illustrate, it is not many years ago that the Calumet & Arizona Mining Co. was organized to carry out one of the riskiest pieces of mining that has ever been inaugurated in Arizona; this was to sink a shaft to open up an indicated body of ore at a depth of more than 1000 ft., lying alongside of the Copper Queen's wonderful deposit. Such was the risk attached that this latter company would not even buy the ground, which was offered to them at different times, either not being convinced of its value, or perhaps not conceiving that anyone had the nerve to go after it; however, the unexpected happened, and another great mine was born. But not under Mr. Joralemon's specifications; not only was there no ore in sight, but the possibility of ore was denied to the extent that the stock of the company, which, after the ore was actually found, sold for $200 per share, just before the reaching of the orebody was peddled about the town, with no takers at very low prices, reported at the time as $1 per share, and the whole enterprise was derided as a wild-goose chase by the thoughtless and the timid.

Again, there has recently been opened up a body a good ore of such merit that it is thought by the owners that it is going to make one of the great mines, and its present behavior in the way of shipments is going far to prove this claim; this mine, the R.R.R., was held under option by the C. & A., as it is generally known here, for a considerable time, and was finally refused, not on account of the price, which was a fraction only of what it sold for later, but because a first payment was required; in this case the original owners were out the considerable sum of $35,000, in work, in preparing expert reports and in purchasing the interests of former partners, and I believe that they agreed to take only one-half of this sum as first payment, to no purpose, because the trade fell through on this account.

In sober truth the business of prospecting is bound to die out, if it becomes apparent that buyers of mines are not willing to pay a reasonable first payment to the finders; the decadence already noticed and deplored may possibly be traced to the disinclination of buyers to pay at once. That is when the prospector needs money more than at any other time; he is usually in debt, and his credit is based on the ownership of his claims, and if he cannot secure some cash when he sells, it is a direct blow to his credit, and is a solar plexus for those around him. I can well remember when any sober and industrious prospector could get all the credit he needed, but it does not seem to be that way now, and it can be maintained against all arguments, that if the line of prospectors dies out, there will be little need of buyers, companies, geologists, or any other mining paraphernalia.

JOSIAH BOND.

Alto, Ariz., Sept. 12, 1912.

Safety Appliances in Mines

My attention has been drawn to a paragraph in an article appearing in the JOURNAL of Apr. 27, 1912, written by Claude T. Rice, on "Safety Appliances in Inclines."

Knowing that Mr. Rice—and I daresay all of your readers—are desirous of learning what they can on such matters, and also in defense of Australasian mining laws, I am pleased to be able to state that the man- and ore-skips in the incline shaft on this property are fitted with safety appliances which are tested regularly. The man-skips take 10 men and the ore-skips are of 2½ tons capacity. Tests made last week showed that none of the four skips dropped more than 2 in. when let go. In addition to these safety grips, the equipment includes safety detaching hooks in case of overwinding, before which point, however, the skip has passed over automatic blocks, which assume an upright position behind the wheels of the skip and against the framing of the roadway of the headgear. This is a seconday precaution to supplement the other safety devices.

The Long Tunnel incline shaft was sunk in two sections to a depth of 2228 ft. in February, 1904, at an angle of 49° 3′, and it was shortly after that date that the above mentioned appliances, in compliance with the mining regulations, were adopted. The shaft is now a composite one, being 4000 ft. on the angle given and 300 ft. vertical. The rock covering directly over the latter portion of the shaft is in the vicinity of 4000 ft. vertical.

There is much in Mr. Rice's article that most mining men will agree with, but one can scarcely put "several sets of guides" against the lives of men, or even against the destruction of a skip at the bottom of the shaft.

JOSEPH MILLER,

General Manager, Long Tunnel Mining Co.

Walhalla, Victoria, Aug. 30, 1912.

Prohibition Mining Camps

The remarks about liquor licenses in the town of Highgrade, Calif., in the JOURNAL of Aug. 31, 1912, remind me of conditions in Morenci, Ariz., several years ago. At that time no liquor licenses could be obtained there, but there was some land about two miles away not owned by any of the big companies, and on this a number of resorts had been erected, known as "Slagtown," or "Jagtown." A line of lanterns could be seen going over the hill from Morenci to Slagtown on dark evenings, and returning later. Perhaps in time Highgrade will also have its "Slagtown."

O. S. WEBBER.

St. Louis, Mo., Sept. 6, 1912.

A Question of Royalty

Various opinions have been advanced here as to the effect that drying ore would have on the royalty. Should this be paid on the railroad weights of the ore shipped or on the ore as it is mined? If the former, then if by drying the ore looses 10% of its weight, should the fee owner loose 10% of his royalty?

I should be glad to have the views of other readers of the JOURNAL on this subject.

QUESTIONER.

Virginia, Minn., Sept. 26, 1912.

Trimming Roofs of High Stopes

By Claude T. Rice

When trimming loose slabs from low stope roofs in the lead districts of southeastern Missouri the miners stand on portable horses. To reach roofs from 12 to 60 ft. high, four-post stages are used. Pillars are trimmed by the use of ladders. The general practice is to trim the roofs as the running stope advances.

The disseminated ore now being mined in the lead district of southeastern Missouri, is the lower 30 or 40 ft. of a flat-dipping dolomitic limestone. At times the lead extends higher up in the Bonne Terre formation. Much of the ground in the district has a tendency to break away in slabs, depending on the nature of the rock and the shattering due to the slight crumpling the region has undergone.

In good ground 50 ft. is left between pillars, while with a bad roof the distance is sometimes reduced to 20 ft. The general width of pillar is 20 ft., although in high stopes this sometimes increases to 40 ft. From 17 to 35% of the ore is left behind as pillars, the usual average being 20 to 25%. Of course, whenever possible, pillars are cut in the poorest ore. Even with frequent pillars the roof sometimes slabs when the miners break into the limestone overlying the ore.

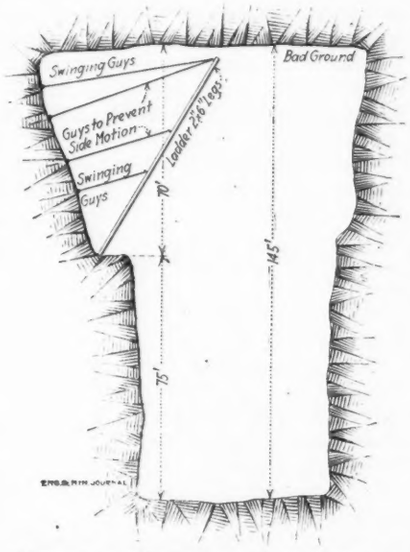
Water Causes Slabbing

Much of the trouble in this regard may be due to hydrostatic pressure generated by wedging shut all water-bearing crevices in the surrounding workings. This water forces its way out along fissures leading over neighboring stopes and the pressure soon loosens large pieces of rock. The stopes are under constant inspection and the wedges are blasted out, as soon as any seepage appears on the roofs, the imprisoned water escaping into the workings. It is cheaper to pump than to bar down slabs from a high roof. Pressures up to 90 lb. per sq.in. have been measured in fissures at the Federal mines.

The roofs are easily reached when the top benches of the stopes are first cut and the running stope is being advanced. Generally trimming is done at this time. Drummy slabs are, as a rule, brought down by gads and bars, but it is often necessary to blast an especially large or stubborn area. Wedging down the roof is more expensive than blasting, but the results are better. It is always necessary for the sake of safety to trim a blasted roof by hand. Holes for blasting are drilled in a variety of ways, depending largely on location and position. Double-hand drilling, piston machines, pluggers and diamond drills are all used for this purpose.

Miners Stand on Horses

Two men always work together when trimming roofs. On high back, up to 12 ft., portable horses are used to support the workmen; they are lighter and easier to handle than the four-post stage, which is employed in the higher stopes. The accompanying illustration shows their construction. The horse is about 7 ft. long; up to a height of 9 ft., the legs are 2x4-in. pieces, the higher horses have 2x6-in. legs. The legs are given a spread of 4 to 5 ft. at the bottom, and are nailed to a 2x6-in. longitudinal piece at the top. From 12 to 18 in. below the top 2x6-in. cross-braces are nailed to the legs; 2x4-in. diagonal struts reach from the ends of the cross-braces back to the legs. The 10 or 12-in. planks on which the men stand are nailed to the cross-braces, one on each side. The horse is placed with its end facing the slab to be barred down; this enables the men to get close up to their work, and at the same time the legs are not in position to be injured by falling rock. One man stands on each side of the horse to balance it.



Method of Trimming Exceptionally High Roof

Four-post Stages for High Roofs

The four-post stages, used for roofs over 12 ft. high, are of two general types. In the first type all the legs bevel in two directions, or along the diagonals of the stage. In the second type the front legs are in a vertical plane and slope toward the sides; the two back legs bevel along the diagonals as in the first type. The vertical front legs, of the second type, enable the men to get close to their work by putting the front towards the slab. By this arrangement there is not much danger of a falling rock hitting a stage leg and knocking it down, but some mines guard against this possibility by drilling a 10- or 14-in. hole in the roof and driving into it a split eye pin with a wedge in the bottom. A rope is tied to the pin and fastened to the stage in such a way that, should either front leg be knocked out, the structure will still stand tied to the eye pin in the roof. This adds greatly to the safety of the work. To steady the higher stages guy lines are carried down from the tops and sides and made fast to pins in nearby pillars.

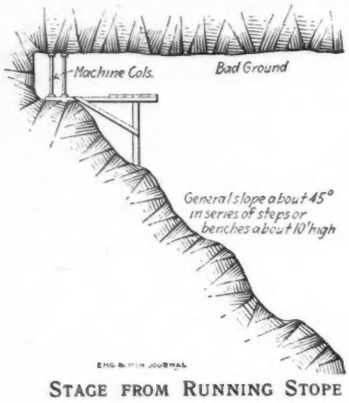
Construction of High Stages

The accompanying drawing gives the details of the high-stage construction. The legs, at the bottom, are 2x6-in. and 2x4-in. plank nailed together to form angles; higher up a single 2x6-in. plank is used and sometimes a 2x4-in. piece is found on top of this. Planks 16 ft. long are used for legs and are spliced by a 24-in. lap joint. The spread of the legs at the stage bottom is about 8 ft., regardless of height, guy ropes being depended upon for stability. The diagonal-panel braces are 1x6-in. timbers; 2x6-in. horizontal side braces are spaced 10 ft. apart near the bottom and 12 ft. apart higher up. Half way between the horizontal side braces 1x6-in. horizontal diagonal braces tie the legs together guarding against failure of the structure should a slab fall down along the side, ripping out the horizontal side braces.

These diagonal braces are used as the intermediate braces on stages about 24 ft. in height when holes are to be put in by machine drill set up either on the ground or from a crib in the center of the stage. The platforms are usually 4½ to 5 ft. square at the top. In some cases the legs project about 4 ft. above the stage; railing planks are nailed to them on the sides and sometimes on the back; the front is always open so as not to interfere with the work. This idea of a railing to keep the men from falling off the stage should they slip or lose their balance, seems a good one, and should be incorporated in the design of all four-post stages. The structures are tipped over on their sides and moved about from place to place as needed, being raised again by means of poles and the guy ropes, care being taken to have an even pull on all the ropes. Broken high stages are used to build smaller ones. These stages have been built up to 65 ft. in height. I have personally seen one 54 ft. tall and have been on a 40-ft. one which was perfectly steady. The height limit appears to be about 60 ft., as after that they become weak in resisting bending when on their sides, and too heavy to move from place to

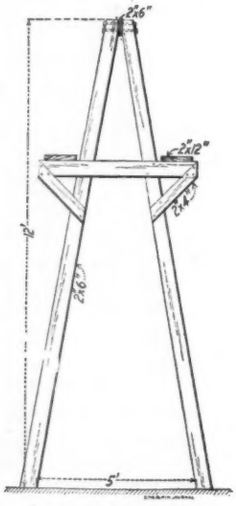
place without breaking. This might be remedied by using bolts in the construction instead of nails, so that the stages could be moved in sections. At the same time it would be a difficult matter to raise such a stage without breaking it, when made sufficiently light.

A 145-ft. back was trimmed in the Federal mine, using a ladder made with 2x6-in. legs, and swung from a small bench on a pillar 75 ft. above the floor of the



STAGE FROM RUNNING STOPE

stope, as shown in the accompanying sketch. Front, side and intermediate guys led back to pins in adjacent pillars and the ladder made steady enough for two men to go to the top and drill holes by hand, for blasting down the loose slab.



SAW-HORSE STAGE

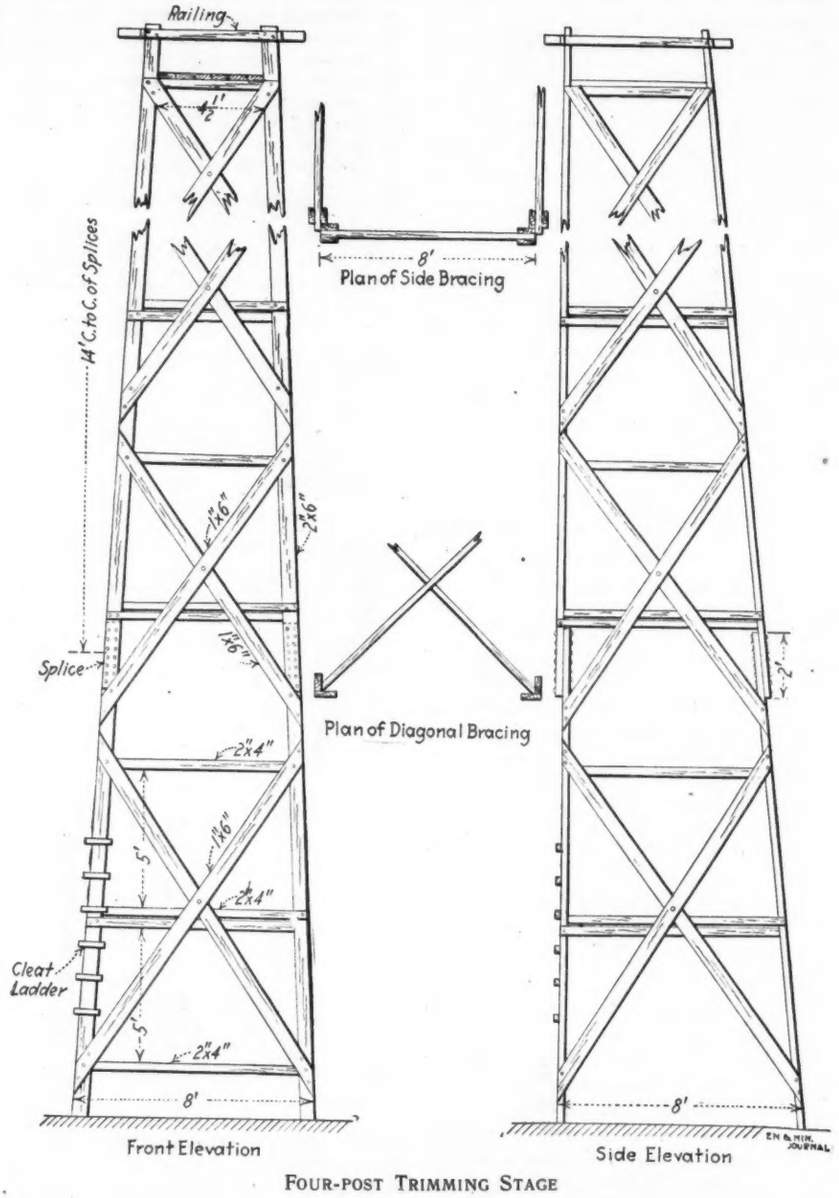
Long ladders are generally used to trim the sides of pillars. When the slabs are large and so high that the ladder may be broken by falling rock, it is possible to work on a platform hung from pins anchored in the side of the pillar. The ladder can then be removed. The use of ladders is economical, for even if the long ones are frequently broken the parts can be used again to better advantage than can the broken stages. It should be made compulsory for the miner to tie his ladder to a pin fixed in the solid ore, for it is impossible to tell which way a slab will bounce as it strikes the side of the pillar in falling. It could easily knock the ladder out from under the men working on it. A life line carried down the ladder from the pin would also be advantageous.

The sides of pillars have been scaled by a spiral plank walk carried on pins driven in holes drilled ahead from the last plank. This method has been used when the slab was near the top of a high pillar, inaccessible by ladder from the stope floor. Needless to say, this scheme is seldom used, but it is worthy of mention, as it is practicable in extreme cases.

The general practice is to trim the roof of all slabby ground as the top heading is advanced. Any brow caused by undermining a thinning bed of dolomite in the roof is broken down and any sudden drops from one bed to another are beveled off with a few half uppers.

In staging out from the top of the running stope, a bent of timbers supports the outer ends of the main longitudinal sills, while the inner ends which rest on the floor of the top heading are jacked down tight from the roof by machine columns as seen in the accompanying sketch. Cross planks are placed on the sills to complete the staging. The longitudinal sills are sometimes braced against side swing and a boom stage about 12 ft. long swung around the main stage as a pivot. The timbers of the boom stage go over one of the timbers of the main stage and back under the other one which may be jacked down from the roof by a machine column. When it is desired to extend the boom stage much beyond 12 ft., it is necessary to support it by ropes tied to pins in adjacent pillars.

A blast in a diamond-drill hole is a cheap way to get down a wide area of loose roof, not too far away from the place where it is possible to set up the drill. It is only possible to reach about



FOUR-POST TRIMMING STAGE

5 ft. in starting a diamond-drill hole. It is the best policy, however, to blast as little as possible; whenever shooting is required black powder should be used as it has less of a shattering effect than dynamite. Black powder tends to split the slab off along existing lines of weakness. The holes should be flat to allow the gases to spread out along the bedding planes.

At some of the Desloge shafts a trimming stage is used which is pushed up, with the men on it, by compressed air. It consists of a set of telescoping pipes, which carry a stage on their top section. From the top pipe a rod extends far enough to prevent the men being squeezed between the platform and the roof. When the stage has reached the proper height the pipes are clamped in position.

The legs of the four-post stage are not shown correctly in the side elevation in the sketch on p. 630; the plan of diagonal bracing in the same drawing, however, gives the proper construction of angle-legs of the stage.

Increase in Feldspar Production

The year 1911 showed the largest production ever recorded in the feldspar industry, the output being greater by 901 tons than that of 1907, the year of maximum production until 1911. The production in 1911, according to a report on feldspar and quartz, by Jefferson Middleton, of the U. S. Geological Survey, was 92,700 short tons, against 81,102 short tons, in 1910. In 1911 deposits in California, Connecticut, Maine, Maryland, Minnesota, New York, North Carolina, Pennsylvania, and Virginia were worked. Maine led all other states in quantity produced, with 25,976 short tons; New York was second, with 18,800 short tons; Connecticut third, with 16,497 short tons; Pennsylvania fourth, with 13,284 short tons; and Maryland fifth, with 12,694 short tons.

The principal use of feldspar is in the manufacture of pottery, enamel ware, enamel brick, and electrical ware. Of these the most important is its use in the body and glaze of pottery and vitrified sanitary ware, in which it constitutes from 10 to 35%. Other uses of feldspar, which do not require the high grades demanded by the pottery trade, are in the manufacture of emery and corundum wheels, in the manufacture of opalescent glass; as a poultry grit, and as a constituent of roofing material. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth. For this purpose it brings the highest prices—from $6 to $8 per bbl. of 350 lb. It is also used in the manufacture of scouring soaps and window wash. The use of feldspar of the lower grades for poultry grit, roofing, etc., seems to be on the increase, and in 1911 a small quantity was used as railroad ballast.

Guatemala Systematically Prospected

Guatemala is the most backward of all the Central American Republics, as viewed from the standpoint of mineral production. With the exception of a small hydraulic property, at Las Quebradas, Department of Izabal, which has been worked from prehistoric times, there are no producers worthy of mention. On account of the difficulties of prospecting, common in all tropical countries, little intelligent development work was done.

This inactivity resulted in the granting of a concession to A. E. Spriggs, of Montana, carrying the exclusive right to prospect in the republic from May 15, 1911, to May 15, 1913, and the exclusive right to denounce any mineral discoveries until May 15, 1914. The Guatemala Mining & Development Co., an American company, with offices at 115 Broadway, New York, took over the concession and has just finished a systematic prospecting campaign, covering the whole republic with the exception of the Department of Peten, on the Yucatan frontier, where the climatic conditions and hostile natives make prospecting difficult.

The republic was divided, for prospecting purposes, into 50 districts, each district was assigned to an American engineer, who had in his party a practical miner and 50 natives. Each party made a reconnaissance of its district, getting as much information as possible from the native farmers regarding any mineral in their immediate vicinity. All prospects were carefully examined and notes taken on the territory covered. Each party was provided with a portable assay outfit with which rough determinations were made. Any property that looked at all promising was carefully sampled and the assays made at the central office in Guatemala City. The field notes of each party were sent to the central office from time to time and from them a complete geological map of the Republic of Guatemala has been developed. A total of 39 American engineers was employed. While the concession has served to keep foreign prospectors out of the country, it has caused great native activity. Before this time if a Guatemaltekan with no capital did find a prospect that looked promising to him, it was a difficult, if not impossible task, to do anything with it. The Guatemala Mining & Development Co. has established an office in Guatemala City, where all specimens are assayed free of charge. If they prove good an engineer is sent to examine the property.

A feature of the country which has caused great disappointment and has materially hindered prospecting, is that recent lava flows have capped and shut from view great sections of the most highly mineralized belts. An example of this is the Santa Maria volcano, which has covered an area of 50 sq.mi. with glass and volcanic ash from 10 to 100 ft. deep.

The results so far made public show that basic zinc ores are widely disseminated throughout the country, silver-lead ores are also frequently encountered. A fact worthy of note, however, is that up to the present no free-milling gold ore has been found. Aside from the work of prospecting, the Guatemala Mining & Development Co. has reopened and is developing a lead-silver *antigua* at Concepcion, in the Department of Chiquimula.

Mining in Rhodesia

JOHANNESBURG CORRESPONDENCE

At the end of June the ore reserves at the Globe & Phœnix mine were about 180,000 tons, of a value of £1,341,196, or practically the same as they were last year. Developments on the 19th, or lowest level, are poorer; but sufficient encouragement has been met to warrant the sinking of a new vertical shaft, the work on which has been begun.

A quartz-reef discovery was recently made near Gatooma by loaming and trenching. The grade is said to be high over a width of 10 ft. for 300 ft. A similar discovery was made in the Enterprise district, near Salisbury.

ROASTING PLANT AT ANTELOPE MINE

The ore reserves at the Antelope mine are 102,000 tons, valued at 40s. on the main oreshoot and 6300 tons valued at 32s. in other orebodies. The mine is to be equipped with an all-roasting plant on West Australian lines, to treat 4000 tons per month. Mining on this scale will exhaust 200 ft. in depth per year, as the shoot is short.

At the Cam & Motor mine, nearly a million tons of 10-dwt. ore are now exposed. In two crosscuts off the south drive, on the fifth level, the reef assayed 11 dwt. and 24 dwt., respectively, over 37 ft. and 15 ft. In places the orebody is 50 ft. wide.

The Giant mines continue boring to find the orebody lost at the seventh level; the results are encouraging. This mine has still about 300,000 tons in its reserves. In the past it has been one of the largest producers in Rhodesia. The Shamva mine has developed 2,142,000 tons, valued at £1 per ton recovery, with working costs estimated at 8s. per ton. The mine is valued in the market at about £1,600,000.

The yearly report of the Eldorado mine shows that a profit of £116,691 was made in 1911-1912. The ore reserves are 150,-

000 tons, valued at 13 to 15 dwt. over a stoping width. These show a reduction of 50,000 tons, due to a shortening of the oreshoot because of disturbed ground on the eighth and ninth levels. There are two parallel oreshoots and the total length of these at the seventh level was 790 ft. On the eighth and ninth levels the total length is about 300 ft. only.

The Falcon mine is developing a large quartz and schist body containing auriferous chalcocite and copper pyrite with some free gold. There are 630,000 tons fully developed above the fifth level, of a copper-gold value of 46s. per ton. In places the ore lenses are 90 ft. wide of a value of 60s. On the fourth level the lode is 20 ft. wide, assaying 9.7 dwt. gold and 4.22% copper. It is proposed to issue debentures to raise £300,000 to erect a plant consisting of concentrator and smeltery to treat concentrates. The proposed capacity is 15,000 tons per month. Probably the concentration plan includes a flotation process. The mine is at Umvuma.

The Bushtick mine, 30 miles from Bulawayo, is increasing its plant by four Nissen stamps and a tube mill, to treat 10,000 tons per month. The orebody is a vast shear zone in schist, but is of low grade.

The Wanderer mine, in the Selukwe district, has been working for many years crushing and cyaniding direct. So far, the 250,000 tons mined per year have been from the oxidized outcrops of bodies of pyritic hornblende schists; where the sulphides are reached, the ore is too hard and of too low grade to be payable. There are 350,000 tons in sight, but the mines have no future.

Two other mines will be producers in the future. The Eileen Alannah reports 215,000 tons of payable ore developed, and a plant to treat 3000 tons per month is ordered. The main oreshoot apparently pitches into the Cam & Motor ground.

In the Connemara mine, 90,000 tons of ore, valued at £160,000, are developed above the first level on an oxidized orebody. The orebody in the sulphide zone is promising, but has not been sufficiently explored to make the future of the mine secure. There has been another breakdown at the smelting plant of the Star of the Congo mine.

The reaction of the recent mining boom is now being felt in Rhodesia; business is stagnant and mining, despite a good output, is dull in most districts. Few discoveries are being made and new producers will be needed to take the place of the older mines, which are gradually dropping out.

The recent tin discoveries have given most disappointing results. The tin-ore occurrences in the pegmatite dikes have, as is usual in most parts of the world, proved too erratic to furnish reliable orebodies, and there are no important alluvial deposits. Owing to special freight rates, chrome iron ore is mined at a profit, sent by rail 560 miles to Beira and shipped to Europe; but the export of other base metals is unimportant.

September Mining Dividends

Mining dividends paid by 30 companies in September amount to $5,956,294; by holding, metallurgical, and industrial companies allied to the mining industry, $10,704,967; and by Canadian and Mexican mining companies, $1,610,181. Calumet & Hecla raised its dividend rate to $12 quarterly, the third successive quarterly increase. In view of the Mexican troubles, the dividend record of seven Mexican mining companies, of $1,238,457, is truly remarkable.

United States Mining Companies	Situation	Per Share	Total
Bunker Hill & Sullivan, l.s.	Ida.	0.20	65,400
Bunker Hill Con., g.	Calif.	0.05	10,000
Calumet & Ariz., c.	Ariz.	1.00	596,353
Calumet & Hecla, c.	Mich.	12.00	1,200,000
Champion, c.	Mich.	1.00	100,000
Colorado, l.s.g.	Utah	0.03	30,000
Doe Run, l.	Mo.	1.50	98,673
Fremont, g.	Calif.	0.02	4,000
Federal M & S pfd., l.s.	Ida.	1.50	180,000
Frontier, l.z.	Wis.	2.00	2,500
Gold Chain, g.	Utah	0.02	20,000
Gold Dollar Con., g.	Colo.	0.00½	12,500
Golden Cycle, g.	Colo.	0.02	30,000
Klar Piquett, l.z.	Wis.	0.25	5,000
Hecla, l.s.	Ida.	0.05	50,000
Homestake, g.	S.D.	0.50	109,200
Iowa-Tiger Leasing, l.s.g	Colo.	0.112*	.....
Nevada Con., c.	Nev.	0.37½	749,784
North Star, g.	Calif.	0.30	75,000
Pittsburgh-Idaho, l.	Ida.	0.04	32,120
Quincy, c.	Mich.	1.25	187,500
St. Joe, l.	Mo.	0.15	150,000
Success, l.z.s.	Ida.	0.03	45,000
Superior & Pitts., c.	Ariz.	0.30	449,939
Tom Reed, g.	Ariz.	0.05	45,478
United Verde, c.	Ariz.	0.75	225,000
United Copper Min.	Wash.	0.01	10,000
Utah Copper, c.	Utah	0.75	1,181,347
Wasp No. 2, g.	S.D.	0.02	10,000
Yukon Gold, g.	Alaska	0.07½	262,500
Yellow Pine, g.	Nev.	0.02	19,000

Coal, Iron, Industrial and Holding Companies	Situation	Per Share	Total
American Coal	Penn.	0.75	37,500
Am. Sm. & Ref. com.	U. S.	1.00	500,000
Am. Sm. & Rf. pfd.	Mex.	1.75	875,000
General Asphalt, pfd.	U. S.	1.25	164,120
General Chem., com.	U.S.	1.50	122,269
Harbison-Walker, com.	U.S.	0.50	90,000
Int. Nickel, comm.	U.S.	5.50	637,200
National Lead, com.	U.S.	0.75	154,914
National Lead, pfd.	U.S.	1.50	426,433
Phelps Dodge	U.S.	2.50	1,125,000
Pittsburgh Steel, pfd.	Penn.	1.75	218,750
U.S. Steel, com.	U.S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Blanca, s.	Hid.	0.90	11,250
Crown Reserve, s.	Ont.	0.05	88,441
Dos Estrellas, g,s.	Mich.	2.50	750,000
Hedley, g.	B.C.	0.30	60,000
Kerr Lake, s.	Ont.	0.25	150,000
Lucky Tiger, g.s.	Son.	0.05	35,767
Mex. Mines of El Oro	Mex.	1.46	262,440
Peñoles, g,s,l.	Dur.	1.25	150,000
Santa Maria de la Paz, s	S.L.P.	2.50	24,000
Standard, s.l.	B.C.	0.02½	50,000
Tem. & Hud. Bay, s.	Ont.	3.00	23,283
Victoria, s.	S.L.P.	2.50	5,000

*Dissolution dividend.

Mining dividends paid by United States mining companies making public reports amount to $42,182,413 for the first nine months of the year, and for mining, metallurgical and allied companies, to $128,773,724.

Chronology of Mining for September, 1912

Sept. 3—An explosion of firedamp in the Clarence colliery, near Bruay, Département du Nord, France, killed 61 men, including some of the rescuers who entered the colliery after the initial explosion.

Sept. 4—Heavy rains flooded the Ruddy mine, at Biwabik, Minn., causing caving at the shaft and entombing three men.

Sept. 5—One man was killed and five slightly injured in an overwinding accident at the Bunker Hill & Sullivan mine, at Kellogg, Idaho.

Sept. 15—Mexican rebels captured the town of El Tigre, Sonora, Mexico, and robbed the Lucky Tiger-Combination Gold Mining Co., of bullion and merchandise.

Sept. 16—One man was killed and two injured by an explosion of gas in the Wharton Coal Co. colliery, at Coral, Penn., a few hours after the mine had been declared nongaseous by the inspectors.

Sept. 18—Miners at Bingham, Utah, went out on strike upon refusal of the companies to advance wages 50c. per shift and recognize the union.

Sept. 28—Nevada Consolidated Copper Co. voluntarily advanced wages at Ely about 25c. per day.

American Iron and Steel Institute

Secretary McCleary has sent out a preliminary announcement of the third general meeting of the institute which will be held at Pittsburgh, Oct. 25 and 26. There will be forenoon, afternoon and evening sessions on Friday, the papers and discussions relating respectively to business topics, technical and works subjects and welfare work. A banquet will be given Friday evening at which the members will be guests of the institute. Saturday will be devoted to seeing Pittsburgh and vicinity. Among the papers and addresses in preparation for the meeting are the following:

"The Use of Mayari Iron in Foundry Mixtures," by Quincy Bent, assistant to the president Maryland Steel Co.

"The Manufacture of Ordnance at the Bethlehem Steel Works," by E. G. Grace, vice-president and general manager Bethlehem Steel Co.

"Electric Power Production and Distribution in Steel Works," by Stewart C. Coey, engineer, Youngstown Sheet & Tube Co. Discussion led by B. R. Shover, Brier Hill Steel Co.

"Coal Mine Ventilation in the Connellsville Coke Region," by Austin King, chief mine inspector H. C. Frick Coke Co. Discussion led by Wilson A. Luce, General Manager Ellsworth Collieries Co.

"The Technical Training of Salesmen," by James Camp, Carnegie Steel Co. Discussion led by E. P. Thomas, president United States Steel Products Co.

"Microscopic Analysis of Steel Sheets," by C. Arthur White, American Sheet & Tin Plate Co.

"Recent Developments in the Preparation of Iron Ores," by J. W. H. Hamilton.

"The Buyer from the Manufacturer's Standpoint," by John L. Haines, assistant to the vice-president Jones & Laughlin Steel Company.

United States Foreign Steel Trade

Exports and imports of iron and steel and of machinery in the United States for seven months ended July 31, are valued as below by the Bureau of Foreign and Domestic Commerce of the Department of Commerce and Labor:

	1911	1912	Changes
Exports	$139,099,793	$164,958,525	I.$25,858,732
Imports	17,942,937	15,960,533	D. 1,982,404
Excess, exp.	$121,156,856	$148,997,992	I.$27,841,136

Increase in exports, 18.6%; decrease in imports, 11%. The leading articles of iron and steel were, in long tons:

	Exports		Imports	
	1911	1912	1911	1912
Pig iron	76,577	148,703	97,552	64,604
Scrap	51,438	62,191	12,572	9,595
Billets, blooms, etc.	149,419	165,248	17,395	10,784
Bars	82,184	116,818	16,497	15,377
Rails	269,853	271,747	326	1,779
Sheets and plates	190,793	309,501	1,411	1,847
Structural steel	125,665	164,685	216	1,430
Wire-rods	9,560	37,219	10,002	8,381
Wire	120,911	143,933	.....	.....
Nails and spikes	45,736	58,233	.....	.....
Tinplates	30,291	54,165	12,369	1,053
Pipe and fittings	111,784	153,933	.....	.....

Imports of wire not reported in quantities; values were $820,002 in 1911, and $606,402 in 1912. Exports of mining machinery were valued at $4,054,615 in 1911, and $4,072,296 this year.

California Oil in August

The net production of petroleum in California fields in August was 7,170,989 bbl., a daily average of 231,321 bbl.; an increase over July of 139,131 bbl. in total net production and 5068 bbl. in daily average production. The increases were in Coalinga, Sunset-Maricopa, Midway, Lost Hills, Fullerton-Puente, Whittier, Coyote-La Habra and Ventura.

August shipments totaled 6,685,106 bbl., an increase over July of 370,527 bbl. The daily average shipments were 215,648 bbl. in August, and 203,373 bbl. in July, an increase of 12,275 in August. Field consumption in August was 421,346 bbl., a decline of 1480 bbl. from July consumption.

The stocks on hand at the end of August totaled 45,924,450 bbl., an increase over July of 434,275. This increase is 36,638 bbl. less than the increase from June to July.

Operation and development in the fields showed 31 new rigs; 73 completed wells; 5508 producing wells active; 704 wells capable of producing, but idle; 399 wells actively drilling; 335 wells on which drilling was suspended; 31 wells being deepened; 8 wells abandoned.

AUGUST OIL PRODUCTION

District	Bbl.
Fresno County	
Coalinga	1,579,576
Kern County—	
Midway	2,136,322
Kern River	905,365
Sunset-Maricopa	510,976
McKittrick	506,360
Lost Hills	116,554
Total Kern County	4,175,577
Santa Barbara County—	
Santa Maria, Lompoc, Cat Cañon	433,863
Summerland	4,350
Total Santa Barbara County	438,213
Southern Fields—	
Fullerton-Puente	487,196
Salt Lake-Sherman	225,227
Coyote-La Habra	109,089
Ventura	59,873
Whittier	54,918
Los Angeles	31,842
Newhall	9,478
Total Southern Fields	977,623
Total All Fields	7,170,989

The Mineral Industry for 1911*

Vol. XX of "The Mineral Industry," covering the year 1911, made its appearance early in September, which is as early as it can be expected. It is hard for the casual reader to appreciate the length of time and the amount of labor required in its preparation. In our opinion, the editor of the present volume has performed his task in a highly creditable manner.

Vol. XX is like its predecessors in scope and arrangement, but is slightly larger than the two just before it. As is customary, statistics of earlier years have been carefully compared with the latest official publications, resulting in the correction of occasional errors found in preceding volumes, as well as the substitution of authentic for estimated figures. Consistency in error has never characterized "The Mineral Industry"; hence it is always safest to consult only the latest published volume.

Among the contributors to the present volume appear the names of most of those who have lent weight to its predecessors. Prof. J. W. Richards writes authoritatively on aluminum; L. S. Austin reviews the progress of copper smelting; Prof. C. H. Fulton outlines recent developments in cyanidation; Professors Richards and Locke abstract the recent literature on gold milling and on ore dressing and coal washing; Prof. H. O. Hofman analyzes the year's advances in lead smelting; Bradley Stoughton describes improved processes in the metallurgy of iron and steel; and W. R. Ingalls performs the same service with respect to zinc. George F. Kunz, as in years past, describes newly discovered occurrences of diamonds and other gems, besides reviewing progress in the older fields. Frederick Hobart writes his customary annual review of the iron and steel industry, and F. W. Parsons does the same for coal and coke.

Concerning these perennial features, it is enough to say that in every resect they maintain their habitual high order of excellence. Regarding certain of the technical reviews, however, it is possible to regret that their distinguished authors do not see fit to supplement their laborious and painstaking abstracts of other people's writings by criticisms and personal opinions of the ideas advanced.

The editor of Vol. XX has enlisted the services of a number of experts, no less distinguished, whose names have not heretofore appeared prominently on the lists of contributors. G. L. English, of Shelby, N. C., writes on monazite and allied minerals. T. T. Gray, chief chemist of the Tidewater Oil Co., describes recent progress in petroleum refining. F. W. Horton, formerly identified with the U. S. Geological Survey's platinum investigations, writes informingly on that metal. Prof. E. C. Holden writes of sulphur, pyrite and sulphuric acid. F. J. Tone, works manager of the Carborundum Co., contributes the article on that subject. A bibliography of recent literature on mining subjects, compiled by Prof. L. E. Young, constitutes a valuable chapter of the volume. J. P. Hutchins and C. W. Purington describe the gold and platinum industries of Russia, a topic on which no better informed authorities could be mentioned. R. S. Morrison, distinguished writer on mining law, is the author of a chapter of abstracts of recent decisions. S. F. Shaw's tabulated data on the principal mines of the world, appearing first in the ENGINEERING AND MINING JOURNAL, is reproduced in full, and constitutes a most valuable innovation. The back of the book contains the usual statistical matter relating to the production and trade in mineral substances by the leading countries, revised and brought up to date, that is, as nearly up to date as the dilatory habits of the statistical bureaus in certain countries will permit. A full and clear index rounds out the volume and adds much to its usefulness.

It would be hopeless to attempt in this space to offer a critical review of the subject matter in the volume. The editor has not always successfully battled with a tendency toward prolixity manifested by some of his contributors. Neither has he always adopted the best possible arrangement of the material; for example, the article on placer mining, much of which might better have been distributed under appropriate captions in the review of gold mining. Similarly, the review on gold milling and that on cyaniding overlap so broadly as to suggest the desirability of

*The Mineral Industry During 1911. Vo. XX. Edited by Charles Of. 6x9, pp. 997, illus., cloth; $10. McGraw-Hill Book Co., New York.

combining the two articles in forthcoming issues. The use of the term "ore" is not to be recommended in connection with asbestos or barite.

A good many typographical errors, and cases of faulty makeup, easily explained by the necessity for haste and by other circumstances attending the period of its preparation, mar the perfectness of the volume without, however, detracting from its value to those familiar with its many virtues.

American Institute of Mining Engineers

Notice is given that the adjourned annual business meeting to consider the report of the special committee and the proposed amendments to the constitution, will be held at 10 a.m. on Oct. 7, at the headquarters of the Institute in New York.

Cleveland Meeting

The 103d meeting of the Institute, for the reading and discussion of professional papers, will be held at Cleveland, Ohio, beginning on the evening of Oct. 28. The provisional program provides for sessions on Oct. 29, 30 and 31, and for trips to various points of interest in the Cleveland district.

The majority of the papers in the following list will be, as usual, read by title, or presented in brief oral abstract only. Printed copies of many of them will be on hand at the sessions. Members desiring to see any of these papers for the purpose of discussion at the meeting, are requested to communicate with the secretary, who will forward in reply advance copies of the desired papers, if they are in print, or will give opportunity during the meeting for an inspection of the manuscripts.

IRON AND STEEL DIVISION

"Method of Surveying and Sampling Diamond-Drill Holes," by E. E. White, Ishpeming, Mich.

"Cuyuna Iron-Ore Range," by Walter A. Barrows, Jr., Duluth, Minn., and Carl Zapffe, Brainerd, Minn.

"The Manufacture of Coke," by W. H. Blauvelt, Syracuse, N. Y.

"The Manufacture of Coke," by F. E. Lucas, Sydney, C. B.

"Notes on Ruff's Carbon-Iron Equilibrium Diagram," by Henry M. Howe, New York, N. Y.

"The Utility of Efficiency Records in the Manufacture of Iron," by John J. Porter, Staunton, Va.

"The Fuel Efficiency of the Cupola Furnace," by John J. Porter, Staunton, Va.

"Blowing In of Blast Furnaces," by Ralph H. Sweetser, Columbus, Ohio.

"On Blast-Furnace Air Pressure," by J. E. Johnson, Jr., Ashland, Wis.

"Notes on Titanium, and the Cleansing Effect of Titanium on Cast Iron," by Bradley Stoughton, New York, N. Y.

"N. M. Wittorff's Preliminary Investigation of Primary Crystallization and subsequent Physico-Chemical Permutations in Iron-Carbon Alloys Containing More Than 4% of Carbon," by Bradley Stoughton and Simon Marcus, New York, N. Y.

"Notes on the Structure of Steel," by William Campbell, New York, N. Y.

"A Novelty in Openhearth Steel-Furnace Practice," by N. E. Maccallum, Phoenixville, Penn.

"The Heat Treatment of Steel Castings," by C. D. Young, Rolla, Mo.

"The Case Hardening of Special Steels," by Albert Sauveur and G. A. Reinhardt, Cambridge, Mass.

"A Comparison of the Action of Various Carbonizing Materials," by Robert R. Abbott, Cleveland, Ohio.

"An Investigation into the Relations Existing Between Hardness as Measured by the Brinell and Scleroscope Methods and Depth of Carbonization Upon Different Kinds of Steel Hardened Under Different Conditions," by Mark A. Ammon, Cleveland, Ohio.

"The Effect of Alumina in Blast-Furnace Slags," by J. E. Johnson, Jr., Ashland, Wis.

GENERAL SUBJECTS

"Centrifugal Machines as Applied to Ore Grading and Ore Concentrating," by Godfrey T. Vivian, Cornwall, England.

"The St. Helens Mining District, Skamania, Wash.," by Horace V. Winchell, Minneapolis, Minn.

"Mine Fires in Metalliferous Mines," by George J. Young, Reno, Nev.

"Present Conditions of Mining in the District of Vladivostok, Siberia," by Albert F. J. Bordeaux, Vladivostok, Siberia.

"The Sampling of Gold Bullion," by Frederic P. Dewey, Washington, D. C.

"A Titaniferous Iron-Ore Deposit in Boulder County, Colo.," by E. P. Jennings, Salt Lake City, Utah.

"An Experience in the Use of Water Power," by C. M. Myrick, San Francisco, Calif.

"Our National Resources and our Federal Government," by R. W. Raymond, New York, N. Y.

"The Ta-yeh Iron-Ore Deposits, Hu-pei Province, China," by C. M. Weld, Lowmoor, Va.

"Clinton Iron-Ore Deposits in Kentucky and Tennessee," by S. Whinery, New York, N. Y.

"The Wood Flotation Process," by Henry E. Wood, Denver, Colo.

"Gold in Eocene Deposits, Texas," by E. T. Dumble, Houston, Tex.

"A Graphic Solution of D'Arcy's Formula for the Transmission of Compressed Air in Pipes," by Nathaniel Herz, Lead, N. D.

"The Alundum Extraction Thimble Used in the Determination of Copper," by L. W. Bahney, New Haven, Conn.

"Notes on the Metallography of Alloys," by William Campbell, New York, N. Y.

"Constitution and Melting Points of a Series of Copper Slags," by Charles H. Fulton, Cleveland, Ohio.

New Geologic Map of Alaska

A map of Alaska, compiled under the direction of Alfred H. Brooks, and recently issued by the U. S. Geological Survey, shows in a general way what is known of the mineral resources of that territory. On the map, which is 17x24 in., areas of gold and silver quartz, gold placers, copper lodes, tin deposits, petroleum areas and gypsum mines are indicated by various symbols in red; marble quarries are aso shown. Because of the interest in Alaskan coal lands, the following different classes are shown by separate colors: Areas underlain by anthracite and high-grade bituminous coal; those which may contain such coal; known areas of low-grade bituminous coal and those which may contain such coal; areas known to contain lignite and those which may contain lignite. The price is 10c. per copy or $6 per hundred.

Imports and Exports of Metals

Exports and imports of metals in the United States, seven months ended July 31, are reported as follows, in the measures usual in the trade:

Metals	Exports	Imports	Excess
Copper, long tons	213,354	105,482	Exp. 107,872
Copper, 1911	205,097	80,111	Exp. 124,986
Tin, long tons	344	31,012	Imp. 30,668
Tin, 1911	842	28,884	Imp. 28,042
Lead, short tons	42,688	55,110	Imp. 12,422
Lead, 1911	61,503	53,623	Exp. 7,880
Zinc, short tons	6,180	3,100	Exp. 3,080
Zinc, 1911	3,565	1,257	Exp. 2,308
Nickel, lb.	15,672,944	22,083,095	Imp. 6,410,149
Nickel, 1911	14,233,495	16,589,322	Imp. 2,355,827
Antimony, lb.	40,992	9,419,796	Imp. 9,378,804
Antimony, 1911	160,844	6,489,053	Imp. 6,328,209
Platinum, oz.	.....	56,302	Imp. 56,302
Platinum, 1911	47	,983	Imp. 60,936
Aluminum, lb.	211,036	11,453,636	Imp. 11,242,600
Aluminum, 1911	.....	.....	.....
Ores, etc.			
Zinc in ore, lb.	13,420,634	15,631,149	Imp. 2,210,515
In ore, 1911	13,127,026	20,435,926	Imp. 7,308,900
Zinc oxide, lb.	20,351,097	.....	Exp. 20,351,097
Zinc oxide, '11	16,519,115	.....	Exp. 16,519,115
Zinc dross, lb.	403,918	.....	Exp. 403,918
Zinc dross, '11	5,238,021	.....	Exp. 5,238,021
Chrome ore, l.t.	.....	31,566	Imp. 31,566
Chrome ore, '11	5	23,068	Imp. 23,063

Copper, lead, nickel and antimony include the metal contents of ores, matte, bullion, etc. Quantity of antimony ore is not reported. Quantity of zinc ore imported in 1912 was 23,026 tons; exported, 13,766. Imports of aluminum were not reported previous to July 1, 1911. Exports of manufactures of aluminum were valued at $781,545 this year. The metal exports given above, include re-exports of foreign materials.

U. S. Chemical Trade

Imports and exports of chemicals and fertilizers, including raw materials for chemical manufacture, in the United States for the seven months ended July 31 were as follows:

	Imports	Exports	Excess
Copper sulph. lb.	.....	5,504,879	E. 5,504,879
Copper sul., '11	.....	6,344,851	E. 6,344,851
Bleach, lb.	41,520,981	400	I. 41,520,581
Bleach, 1911	50,907,542	17,368	I. 50,890,174
Potash salts, lb.	374,784,300	1,710,625	I. 373,073,675
Potash salts, '11	409,709,337	2,428,039	I. 407,281,298
Soda salts, lb.	7,187,205	300,808	I. 6,886,397
Soda salts, 1911	17,024,885	337,909	I. 16,686,976
Acetate lime, lb.	.....	45,777,383	E. 45,777,383
Acetate, 1911	.....	46,964,099	E. 46,964,099
Nit. of soda, tons	310,504	6,034	I. 304,470
Nitrate, 1911	357,519	3,934	I. 353,585
Phosphates, tons	.....	702,767	E. 702,767
Phosphates, '11	.....	710,458	E. 710,458
Sulphur, tons	15,377	24,944	E. 9,567
Sulphur, 1911	12,027	16,297	E. 4,270
Pyrites, tons	555,059	.....	I. 555,059
Pyrites, 1911	578,424	.....	I. 578,424
Magnesite, lb.	128,756,843	1,333,024	I. 127,423,819
Magnesite, 1911	164,125,494	1,443,095	I. 162,682,399
Sul. ammonia, lb.	56,560,924	357,600	I. 56,203,324
Sul. am'nia, '11	96,223,359	.....	I. 96,213,359
Arsenic, lb.	2,983,425	850	I. 2,982,575
Arsenic, 1911	2,951,920	3,000	I. 2,948,920

Exports include reëxports of foreign material. Estimating sulphur contents of pyrites the total quantity of sulphur imported this year was 223,562 tons.

Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Emergency Pump Installation

By D. R. Thomas*

The following notes on pump installation may be of interest to those in charge of mines subject to sudden flows of water. I was once compelled to install a 400-gal. pump in as short a time as possible to save the mine from being drowned out. It may be mentioned this mine was 60 miles from a railroad and no facilities were at hand such as are found in ordinary mining camps. After the pump station was finished and the muck cleaned out, 8x8-in. cross ties were laid on the floor; on these were laid longitudinal stringers on which the pump rested. While the timbermen were leveling up the timbers the mechanics were bolting the pump together and in a few hours the pump was running; by this time the water had gained on the sinkers till the men were knee deep in water. When the pump was started up it rocked when running at high speed; however, as the pump was a compound machine of the "bob-tail" type, it did not matter much; the exhaust steam was turned into the sump as no time was found for connecting up the condenser. In a few days the water was under control and a box was made around the pump and concrete was run in between the timbers on which the pump rested. In a few days this hardened so that the pump was perfectly solid. The condenser was then connected up. It may be mentioned that no bolts of any kind were used except four lag screws through the feet of the pump.

To avoid putting screens around the suction a partition was placed in the sump like a division in a zinc box; whatever material floated on the water was caught and all the grit and sand sank in the first compartment so that the pump had clear water to handle all the time.

In order to be sure of holding the water from overflowing the sump and flooding the shaft, a wheel about 10 in. diameter was bolted on the throttle valve (the throttle valve used was a plain globe valve) over which a bell rope was passed to a float in the sump and a counterweight at the pump. This arrangement proved satisfactory to hold the water level within a range of four inches.

*Mining engineer, 55 Liberty St., New York.

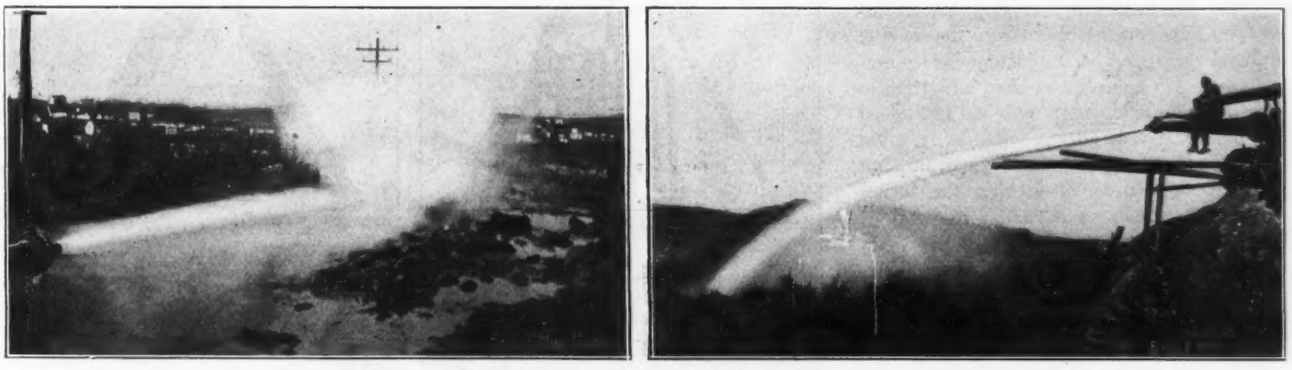
Hydraulic Surface Exploration

By Herbert A. Megraw

An interesting method of surface prospecting is being practiced by the Nipissing Mines Co., in the Cobalt district of Ontario, Canada. The bedrock is covered with drift, soil and vegetable growth, which makes examination of the rock by the usual trenching method slow and expensive. In view of the existence of many small fissures, which traverse the rock in all directions, an examination of the surface is believed to be of great advantage in assisting exploration and a method has been devised for exposing the rock at a minimum expense.

The method consists in washing off surface débris with a stream of water under pressure. To do this there has been installed a single-stage centrifugal pump, with a capacity of 48,000 gal. per min., directly connected to a 650-hp. motor, which pumps water from Cobalt Lake and delivers it through a pipe line to a hydraulic giant of the type usually used in placer mining. Three nozzles were furnished with the giant to vary the pressure of the water stream. A 3½-in. nozzle throws the water with a pressure of 125 lb. per sq.in. at a height of 150 ft. above the pump. When the 3-in. nozzle is used a pressure of 140 lb. is attained, while with the 4-in. nozzle a corresponding reduction of pressure is made.

When the ground is tight and heavy roots and boulders are to be moved, the highest pressure is used, and where there is less weight and plenty of swing is attainable, the lower pressures are put into service. Sometimes heavy boulders or deeply rooted stumps are encountered that do not yield readily to the water pressure, and, in such cases, dynamite is used to break up the rock or to uproot the stumps. It is also simple to open fissures in the rock when it seems desirable for purposes of exploration, by putting in a shot or two and then washing away the débris with the water stream.



Prospecting by Hydraulicking the Overburden from the Bedrock, Nipissing Mine, Cobalt, Ontario

As the object is not to move a quantity of material, but simply to uncover the bedrock, it is unimportant what happens to the débris after its removal from the area to be explored. An area once uncovered, explored and its condition recorded, may be then covered up by the débris from another area. The system allows the examination of the bedrock surface at a cost which is low compared with the expense incurred in trenching.

Pulsometer Handling Solid Material

The pulsometer, having no moving or delicate parts, can handle water containing a large percentage of gritty and solid material without injury to itself. The manufacturers report that a No. 6 machine handled five tons of limestone and quartz per hour, pieces ranging in size from ⅛ in. down, with the greater proportion smaller than $\frac{1}{16}$ inch.

Gasoline Locomotive Underground

The excellent ventilation of the Desloge Consolidated mines in the lead district of southeastern Missouri permits the use of gasoline locomotives in the main haulage ways without any provision being made for the removal or purification of the exhaust gases.

The locomotives have a single 11x18-in. cylinder and are rated at 25 hp. each. They have a plain mixing valve; all openings are large with the exception of the one feeding the gasoline into the carburetor and this is easy of access. The sparker is of the make-and-break type, using a set of eight Columbia multiple dry cells, which last for about 1250 miles. This is a specially constructed cell, well adapted to mine work as it has only two binding posts, consequently fewer connections to wear loose and less danger of broken wires. Due to the one-cylinder construction of the engine a double flywheel is provided for the accumulation of power.

The power is transmitted through a friction clutch of the expanding-spoke type. By means of the slip that is allowed between the clutch and the driving wheel the speed of the locomotive is regulated. No trouble has been experienced with the clutches slipping when full speed is desired. It is also possible to regulate the speed by an adjustable governor, but this is only used in making the larger variations, such as occur at the end of trips. The maximum speed of the locomotive, which is built by William Ellison & Sons, St. Louis, Mo., is 15 miles per hour. On the level it will haul 20 to 25 cars of 1½ tons capacity or 16 such cars up a ¾% grade. Hauls very from 1600 to 2500 ft. With longer pull one locomotive hauls 600 tons in eight hours against a ¾% grade and could easily handle 1000 tons under the same conditions.

The gasoline locomotives have been in use at the No. 4 shaft for three years and elsewhere on the property from 1½ to two years. An extra locomotive is always in reserve for each one in use, making necessary a double equipment.

Mules are used for tramming throughout the mine except in the main haulage levels. This gives a good basis for the comparison of costs. With hay at $12 per ton and corn at 40c. per bu., as it was three years ago, the locomotive is no cheaper than the mule, but with hay at from $28 to $30 per ton and corn at 75c. per bu., as is the case at present, there is an advantage in favor of gasoline haulage.

The ore occurs in and near the bottom of a flat-dipping dolomite formation and about 400 ft. below the surface. The workings are particularly well ventilated by means of churn-drill holes from the surface and a thorough system of underground connections. This fact alone is responsible for the successful operation of the gasoline haulage without any attempt to offset the vitiating of the mine air by the exhaust gases.

Prospecting Headframe

By Charles Mentzel*

Doubtless many have seen headframes similar to the ones here described, but there are a good many who have not, judging from the weird affairs one so often sees when visiting a new camp. A little consideration of the stresses in a headframe and a few minutes calculation will show that a frame of good design and sufficient strength and stability for sinking purposes can be constructed at considerably less cost than the four-post frame, cross-braced on all sides, so often found over a prospecting shaft. In addition, the greater convenience, decrease in surface attendance and greater speed in handling buckets, owing to the self-dumping arrangement, give the type to be described a decided advantage.

Fig. 1. Headframe with Ore Pocket

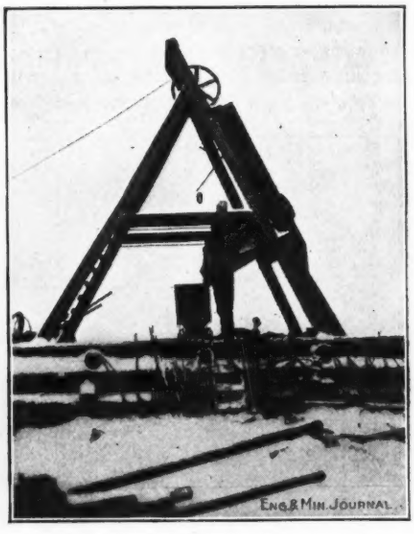


Fig. 2. Low Type of Headframe

This improved headframe can be used either for vertical or inclined shafts. In the former, skids are easier than guides to place in the shaft, and they obviate the use of the crosshead, often a source of danger. Where the ground is good, all the timber necessary is a wall plate about every 8 or 10 ft. tightly wedged to the ends of the shaft. The skids are spiked to the plates.

Prospecting shafts usually follow the ore and, therefore, are almost always inclined; and generally the inclination varies from time to time. The accompanying photos show headframes which I constructed at the West Dome mines at Porcupine in 1911. The one with the pocket is about 40 ft. high and the smaller one about 22 feet.

The essential points entering into the design of a headframe are the height of the car used to remove the hoisted muck, and the distance of the hoist from the shaft. If it is considered advisable to build a frame with a pocket, which will do away with the services of a top man on night shift, it is calculated to hold about 30 tons and to fit between the front posts.

The construction of the bucket is the next consideration. A bucket of approximately 10 cu.ft. capacity is usually about 26 in. diameter at the top, 24 in. at the bottom and about 34 in. deep. Two horns, 8 or 9 in. long and 1¼ in. diameter, are fastened to opposite sides of the bucket about 9 or 10 in. from the bottom, as shown in Fig. 4. They are attached to flanges riveted inside and outside the bucket as shown in detail in Fig. 5. Having the bucket in dumping position, a line may be drawn through the horns at the angle of the shaft as shown in Fig. 3. If the dip of the shaft is greater than 65°, it is better to draw this line at not more than 65°, so as to have the dumping bucket far enough from the shaft to prevent a spill.

The position of the sheave depends upon the height of the dumping device and the amount of overwind allowable. In prospecting shafts the danger of overwinding is small with the slow, low-power, geared hoists usually employed, so 5 ft. is sufficient, and taking the length of bale, clevise, thimble and about 2 ft. of cable doubled to clamp it, gives about 10 or 12 ft. as the distance from the dump to the tangent of the sheave wheel. Knowing the diameter of the sheave and the size of the pillow blocks in the headframe shown in Fig. 1, the vertical posts can be readily located.

Having the front posts, the back braces may be drawn as follows: Scale off dis-

*Mining engineer, 29 Broadway, New York.

tance *CB* of hoist from collar of shaft as shown at Fig. 6. Draw *AE* tangent to hoist drum and sheave. Theoretically the line *AD* bisecting the angle *EAB* is in the best position to receive the pull of the hoist and the resisting pull of the load if these forces are equal. *AD*, however, may be too close to the line of the vertical posts to ensure stability, and it is better in any event to place it so that the foot comes closer to the hoist at *F*. The position of the posts and back braces have now been decided. To find out how to place these with respect to the shaft we must consider how the bucket rides on the skids. This is shown in Fig. 7 and in Fig. 3 at *A*. The skids are 6- or 8-in. round skinned poles dressed at the parts where they are fastened to the wall plates and are placed so that the bucket rides on them as shown, without touching the wall plates. The horns do not come in contact with anything in the shaft. With this sketch made we have the position of the hoisting cable with respect to the shaft and headframe, and referring to Fig. 3, we can locate the posts and back braces.

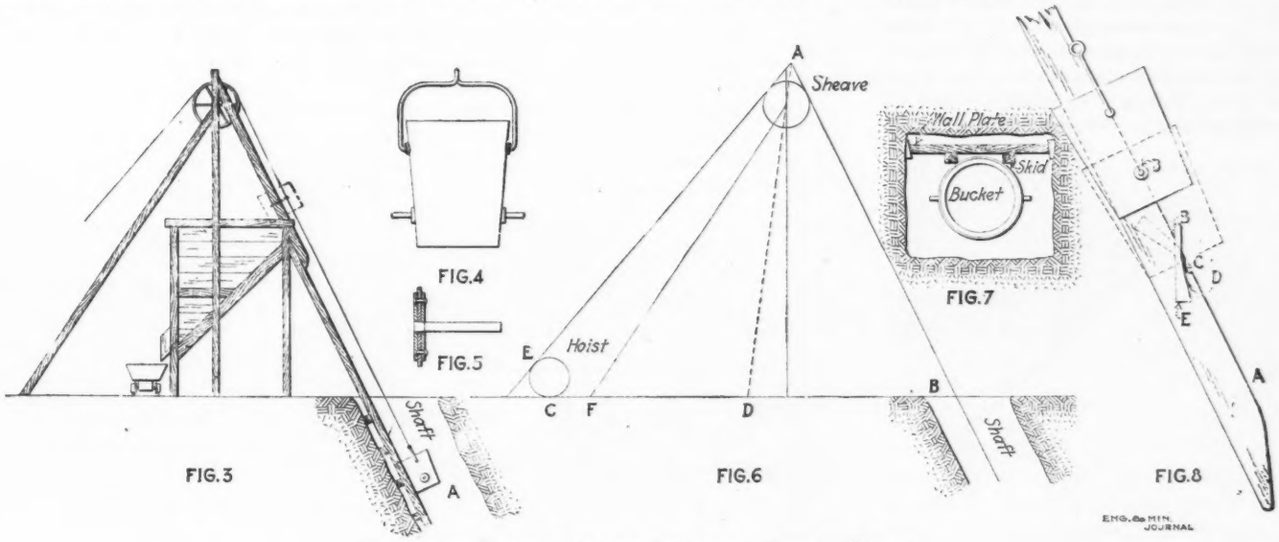
The posts are tied with three girts and a cap, and the back braces with two girts. The batter may be 1:8 or 1:10, depending on the size of the shaft. For foundation, ordinary log cribwork is built up and filled with waste rock and the stringers spiked to the cribbing with drift bolts. In the larger frame 10x10-in. hewed timber was used and 1-in. tie rods and bolts, and 8x8-in. timber for the bin, which had an arc gate made of ¼-in. boiler plate operated by levers as shown in Fig. 1. This worked satisfactorily. The smaller frame, shown at Fig. 2, is constructed of 8x8-in. timber and ¾-in. tie rods. The front posts are set at the inclination of the shaft and are connected with the back braces by means of girts and tie rods as shown.

The shaft skids run from the shaft to the point of dump. The dumping skids of 8x8-in. timber begin about 6 ft. below the dump and are bolted to the headframe as shown in Figs. 1 and 2. As the bucket is hoisted out of the shaft the horns ride on the runners on the dumping skids, which are placed so that the distance between the inner faces is an inch or two greater than the width of the bucket to allow clearance. The shaft skids prevent the bucket from tipping on the horns at this point. The bucket continues up the dumping skids until the horns drop into a dap on each skid. At this point the hoist is stopped and the bucket allowed to swing by gravity, thus dumping. The bucket is now raised a foot or so and then lowered. In lowering, the horns engage trippers which are thrown over the daps allowing the horns to slide down without catching in the daps. The trippers then swing back by gravity leaving the daps free to hold the horns of the bucket on the next trip.

The dumping device is simple and can be made by any mine blacksmith. Fig. 8 shows the construction. The tripper *E* is shown in full lines in its normal position. When the horn *B* engages it on its down trip it carries it with it until it is stopped by the catch *D*. This enables the horn to go past the dap *C* without being stopped by it as shown by the dotted lines. After the bucket has passed, the tripper swings back to its first position by gravity as the lower part of the tripper is made heavier than the upper. The runner *A* with dap *C*, which should be at least 2 in. deep, is made of ⅜x2-in. iron bolted flush with the timber. The tripper is best made of ⅝x3-in. iron and about 20 in. long and should swing from a 1-in. bolt. The construction is apparent. The headframes shown were built at a cost of about $50 for the smaller and $150 for the larger, including all material and labor. Any carpenter of ordinary ingenuity should have no trouble in designing and framing them. For vertical shafts the same form can be used, carrying the skids up and bending them at the collar to meet the frame at the dump. A few saw cuts on the inside of a green pole make it possible to bend it through a considerable angle without breaking. Of course, a roller for the cable is required at the shaft collar in this case.

Concrete Shaft Collar at the Wolverine

At the Wolverine No. 5 shaft, which is being sunk to prospect the Osceola lode at that mine, a concrete collar was put in 56 ft. long and 22x11 ft. in section; outside measurements. The reinforcement was put in differently than at the Mohawk No. 6 shaft, the construction of the collar of which was described in the JOURNAL of Aug. 10, 1912, partly because of less depth of overburden, 16 ft., and partly due to the fact that triangular-mesh reinforcement was used to carry the ropes in the forms as well as to aid in reinforcing the collar.



DETAILS OF HEADFRAME AND AUTOMATIC BUCKET DUMP

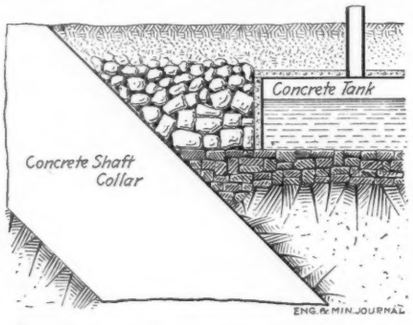
In prospecting for the lode it was necessary to trench through the overburden although previous calculation had shown approximately the position of the lode at that point. This trenching dried up the wells, as the shaft is situated in a small gully that is a water course draining the country near-by. In order to restore the wells to use and to enable the making of a well for supplying the boiler plant, it was decided to make the collar also serve as a dam to back up the water, so confident was W. F. Hartman, the company's engineer, of the watertightness of the concrete collar after his experience with the one erected at the Mohawk shaft.

A funnel was put through the concrete to let the water go through into the shaft while the collar was being erected. Then, after the collar had been completed, the surface that was to be toward the water was coated with tar to help make it waterproof.

In making the cistern for the boilers,

a dry wall of rough masonry was put in on the bottom of the shaft trench, as shown in the accompanying sketch, and a tank with concrete walls was erected on that as a foundation. This tank, or cistern, was covered with concrete, a terra-cotta tile 24 in. in diameter being inserted in the top to serve as a manhole. After this tank had been completed a piece of waste saturated with cement was inserted in the funnel and rammed tight. This shut off the flow of water into the shaft almost instantly, and concrete was then poured in on top of the waste. Next, large boulders were piled in the pit around the shaft and tank, and finally dirt was put on top, and the concrete cistern completely covered over with dirt.

The water rose in the cistern and quite a little water reserve for the boilers was obtained, as the water would filter through the loose rock around the collar and up through the loose masonry at the bottom of the tank into the cistern as fast as the water was pumped from it. About 16,000 gal. of water was thus stored back of the dam, and the water rose to a height of about 12 ft. above the place where the collar was seated on solid ground. Little



CISTERN FOR COLLECTING BOILER FEED WATER ABOVE CONCRETE SHAFT COLLAR

seepage has resulted, although the collar has been in use for several months, and the shaft has been sunk with the aid of only the bucket to do occasional bailing, the foreman calling it a dry shaft.

This shows how watertight it is possible to make these concrete collars by careful construction, so that water can be purposely dammed up around them.

Owing to the fact that triangular-mesh reinforcement was used to center the rope reinforcement in the forms at the Wolverine shaft, and as the depth of burden was only 16 ft., the pieces of old hoisting cable were put in seven inches apart at the bottom. As the collar grew in height the interval was increased to 10 in. Only at the bottom were the side walls reinforced. In other respects the reinforcement was quite similar to that used in the Mohawk shaft, and the method of knock-down forms and of sliding the concrete down troughs to a plat whence it was shoveled into the forms, was adhered to.

An Index System for Maps

BY H. L. BOTSFORD*

The system of filing and indexing maps described herewith is one which I have used for several years in an engineering office and found it to meet all requirements.

FIG. 1. INDIVIDUAL INDEX CARD.

Subject

Number
Index

See Also

Scale	Date	Drawing
Surveyed by	Notes	Tracing
Drawn by	Computations	Print
Traced by	Sketches	Sketch
Checked by		
Remarks		

FIG. 2. GENERAL SUBJECT INDEX CARD.

General Subject

Number	Index	Detail Subject

The maps, tracings, blueprints, etc., are filed flat in shallow drawers which are made to accommodate several standard sizes of drawings. Only one size should be filed in a drawer.

Nine by twelve inches was taken as the unit and the larger drawings were made some multiple of this, as 12x18, 18x24, 24x36 in., etc. Possibly a better unit is the standard letterhead paper, 8½x11 in., which permits folding drawings of any of the sizes so as to be mailed or filed with accompanying correspondence.

Each drawing as it is made is marked with a serial number and an index and a card is made for it showing the subject, scale, date, number, index, authority, references and any general information necessary. Fig. 1 shows the special printed card, 4x6 in., used for this purpose. These descriptive cards are filed consecutively with guide cards at even tens.

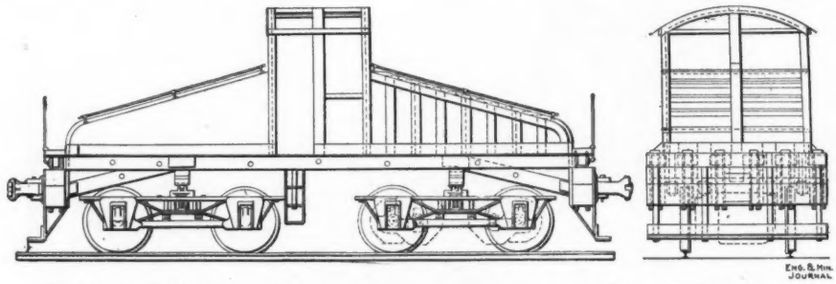
The various drawers in the map cabinet are designated *A, B, C.*, etc., and the maps in each drawer are numbered from one up, beginning at the bottom. Thus *A*-4 is the fourth drawing from the bottom in drawer *A*; *A*-10 is the tenth, etc. In this way, knowing the index of any drawing, it can be readily found.

Reference or subject cards, shown in Fig. 2, are made on which are listed all the drawings pertaining to the various subjects. These subject cards are filed alphabetically and are the ones referred to when in search of drawings. Thus on the card for "Compressors," would be found the title and index and serial number of all drawings of compressors. To further facilitate reference to the files the subject cards were divided into two general divisions, viz., 1—Mechanical, and 2—Mine, Geologic and Topographic Maps.

*Mining engineer, Creighton Mine, Ontario.

A Homemade Electric Locomotive

It is often well to realize that a machine shop at a fair-sized mine is equipped sufficiently well to do large jobs, and that often work which ordinarily would not be thought of as being within the range of the shop, can, if the master mechanic is ingenious, be done at the company's shop at a considerable saving in cost compared to what it would have been if the machine or device were bought outright.



ELECTRIC LOCOMOTIVE MADE IN THE SHOPS OF THE ST. LOUIS SMELTING & REFINING CO.

Most mine operators would not think of building a 40-ton electric locomotive at a mine, but that has been done at the machine shop of the St. Louis Smelting & Refining Co. in southeastern Missouri, in order to keep the men at the shop busy at odd times. The accompanying drawings give an idea of the work. The floor and sides of the locomotives are made of ¼-in. sheet iron. This floor is carried on a series of I beams. Every other one of these beams is cut in two and spliced together by plates, so as to come down at an angle to the bumper timbers at each end of the car. Through the center of this car on each side of the king pin are carried two 6-in. channels which help brace the transoms above the trucks. The work was carried on most successfully and a locomotive produced which was entirely satisfactory for the work at hand.

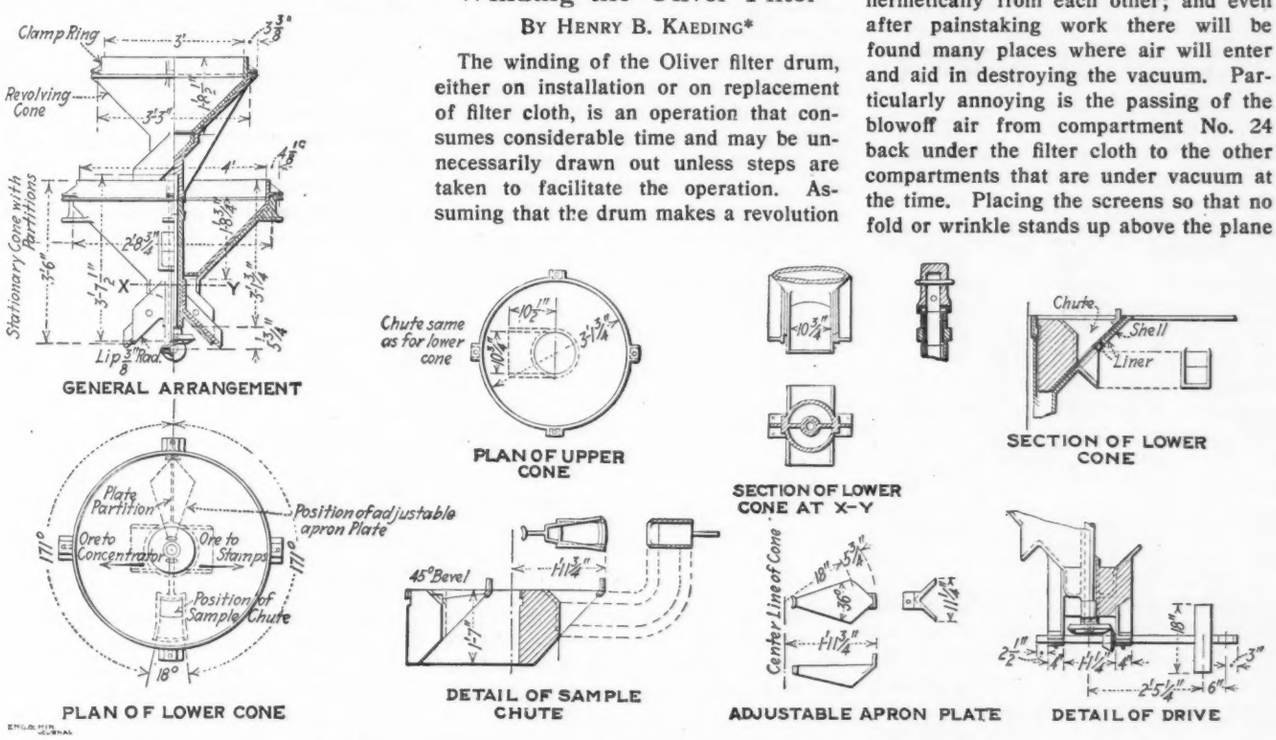
Details of Metallurgical Practice

Records of Experience in Ore Dressing, Cyaniding and Smelting

Automatic Sampling at Tigre Mill

The distributing and sampling device, used at the Tigre mill, El Tigre, Sonora, Mexico, is described by D. L. H. Forbes (*Bull.* A. I. M. E., August, 1912). It is used to distribute the ore between its two mills and at the same time to take a 5% sample. The device, shown in the accompanying engraving, consists of a cast-iron cone with a single discharge spout that revolves about a vertical axis over a stationary cone with three compartments. Between the two large compartments is an adjustable partition which may be set to various positions corresponding to percentages of the total ore that it is desired to give to the No. 1 mill.

From the compartment corresponding to No. 2 mill, a discharge spout delivers the material to a 12-in. conveying belt, which carries it to the stamp battery ore bin. From the sample compartment the portion of ore cut for sampling is dropped into a 7x10-in. Blake crusher, which reduces the size of the largest pieces to 0.75-in. ring. A Snyder sampler placed below the crusher takes out 10% of the original sample, and the large pieces in this sample are crushed in a 2x6-in. Sturtevant roll-jaw crusher, after which the amount of the sample is reduced again by sets of riffle boxes until about 40 lb. are obtained for sending to the assay office. The rejected portions of ore at each step in the sampling drop into the broken-ore storage bin of No. 1 concentrator.



AUTOMATIC ORE SAMPLING AT TIGRE MILL, EL TIGRE, SONORA, MEX.

Winding the Oliver Filter

BY HENRY B. KAEDING*

The winding of the Oliver filter drum, either on installation or on replacement of filter cloth, is an operation that consumes considerable time and may be unnecessarily drawn out unless steps are taken to facilitate the operation. Assuming that the drum makes a revolution in 8 min., it will require 77 hr. to place the wire in position, unless the speed be increased. The manufacturers advise an arrangement of pulleys somewhat similar to my own idea, whereby this time may be cut to considerably less; but the best arrangement of pulleys and countershafting will be found outlined in the accompanying drawing.

In assembling the filter I have found it necessary to use the greatest care in making all joints airtight. The staves that form the body of the filter should be laid in place with the greatest care, and when the ends of the piping are screwed into the staves, these ends should be first hot-tarred and a wisp of oakum packing should be wound about the pipe so that the lock-nut may screw down on it. When all pipes and horizontal strips are in place a liberal application of hot tar (asphaltum) should be given to both sides of the periphery of the drum, running it in around the pipe from both sides where they pass through the wood.

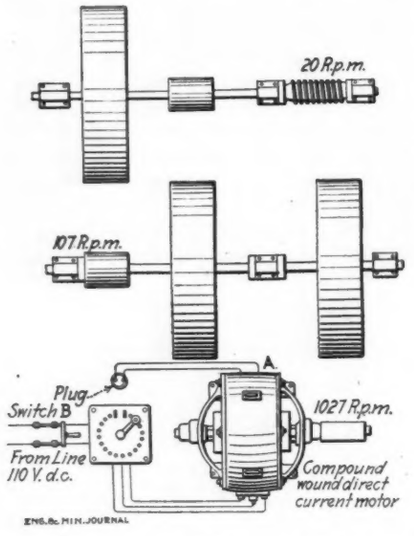
It is not possible to exercise too much care in the endeavor to have the joints airtight and the compartments isolated hermetically from each other; and even after painstaking work there will be found many places where air will enter and aid in destroying the vacuum. Particularly annoying is the passing of the blowoff air from compartment No. 24 back under the filter cloth to the other compartments that are under vacuum at the time. Placing the screens so that no fold or wrinkle stands up above the plane of the rest of the screen offers no particular difficulty, the idea being to avoid high spots that would wear holes in the canvas. The filter cloths may then be put on and the calking ropes driven down and edges tarred.

An examination of the drawing will show a method of arranging the motor, pulleys and countershafts, where the motor is assumed to run at 1027 r.p.m. and the filter drum to take eight minutes per revolution, the number of teeth in the wormwheel being assumed to be 160. The motor drive pulley, a rawhide pulley, 10- or 12-in. face and 5-in. diameter, is belted, either with or without idler, to a 48-in. pulley on the main countershaft. It is preferable to use for this belt an endless one of leather without an idler,

*Mining engineer, 2446 Michigan Ave., Chicago, Ill.

setting the motor on rails that the belt may be kept tight. If an idler is necessary let it be of the type that fastens to the motor frame, causing the belt to cling better to the drive pulley by bringing more surface in contact with the face. At the other end of the main countershaft will be found a 9-in. pulley that belts to a 48-in. pulley on the wormshaft of the filter, thus giving the shaft a speed of 20 r.p.m. Should there not be room for this size pulley on the wormshaft furnished by the manufacturer a longer shaft may be used, allowing the pulley to clear the end of the filter box; or a slight reduction in the size of both pulleys may be made.

A 48-in. pulley on the countershaft is placed opposite a 9-in. pulley on the



ARRANGEMENT FOR WINDING THE OLIVER FILTER

wormshaft, without boxing between; this permits of throwing the belt off one set and on the other without trouble, the filter then being belted for winding and the worm shaft having a speed of 570 r.p.m. and the filter drum a speed of 3½ r.p.m. If it is desired to expedite matters still further an arrangement such as is shown at the motor at *A* may be made use of. At any convenient point such as *A*, the shunt field wire may be cut between coils and the two ends brought out and connected to an ordinary porcelain wall socket located near the starting box. Into this socket screw a fuse plug that has been prepared by placing No. 12 copper wire in place of the fuse wire. The result is that when the plug is screwed in till it forms part of the circuit, the motor is a compound-wound machine of its regular type of winding and of constant speed, but when the plug is removed the motor becomes a series-wound motor and the speed is doubled. A switch could be used in place of the plug but is not as foolproof, offering a temptation to the ignorant to pull it out and investigate, which would cause the filter to double its speed.

To operate this device conveniently, start the motor with the plug in and bring all up to full speed with the starting box; then pull the main line switch *B*, unscrew plug, and when the lever of the starting box has sprung back, throw in main line switch *B* and immediately catch up the speed to full with the starting box. If this is neatly done there is little, if any, diminution of speed in changing the motor from compound- to series-wound. The machinery may also be started on the series motor with the plug permanently out, but care must be exercised to start slowly and get up speed gradually and the starting box is almost certain to overheat during the operation. It is preferable to start with the compound winding and switch off to the series as soon as full speed is attained.

The utility of this method is obvious, the filter drum making nearly 8 r.p.m., or a revolution in 8 sec.; at this rate the entire winding of wire can be put on in 1 hr. and 20 min., exclusive of stops. In practice, however, it will be found to take much more time owing to delays in getting up speed, in slowing down for stops, in repairing broken wire and in stopping for stapling. It is advisable to stop every six or eight turns for stapling unless the operator is sufficiently skillful to drive his staples while the drum is in motion.

Sampling from the Lip of a Challenge Feeder

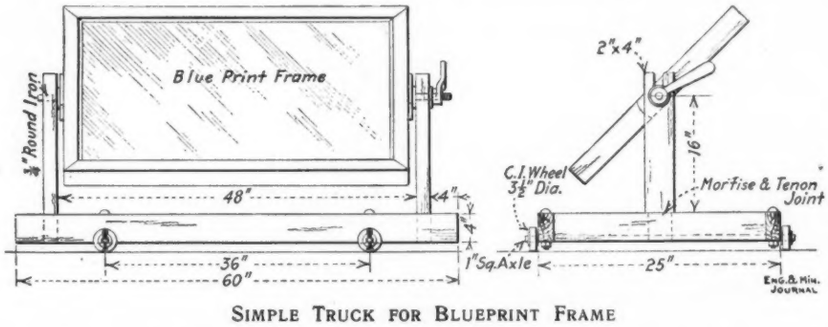
Taking a sample of mill-feed material is not an easy matter when the ore is crushed in cyanide solution. A sample of the pulp issuing from the machine is useless, due to the action of the cyanide solution on the metal content of the ore and also to the amount of metal carried by the cyanide solution itself. A sample before the ore gets into the cyanide solution is thus a necessity and unless a machine-sampling plant is available it is difficult to get a real sample of the mill feed.

Under conditions of this kind one company succeeded in getting a good sample from the lip of the automatic feeders back of the stamps. It was found that to get anything like an accurate sample it was necessary to use the greatest care in carrying out every operation. As a sampler, a narrow, curved box was made of such size that it could be introduced in the mortar opening just under the round plate of the Challenge feeder. A long iron handle was fixed to the box for convenience. The box was made sufficiently deep to prevent the stones bouncing out.

This box was held below the feeder lip for a fixed period of time at fixed intervals, and care was taken to secure all of the stream of falling ore. The success of the sample depends upon getting the entire stream of ore for the fixed period of time, and attention must be paid to the intervals also. It was found that although the sample might not be exact for one day of work, the average over several months was satisfactory.

Truck for Blueprint Frame

The accompanying illustration shows a simple type of truck for supporting a frame when making blueprints. The truck is easily constructed and answers all the purposes of a more expensive device. The clamping device permits the



SIMPLE TRUCK FOR BLUEPRINT FRAME

placing of the frame at the best angle for printing. This truck can be made at any mine shop from materials that will ordinarily be found at hand.

How to Purify Mercury

W. R. Forbes has recently advised, for clarifying mercury, that small amounts of the element be run in stream form through nitric acid and mercurous-nitrate solutions. In greater quantities, mercury should be partially oxidized by drawing air through it. The usual impurities, such as lead and zinc, then rise to the surface as scum.

This may prove unsatisfactory, says Dr. L. K. Hirshberg, since it is apt to leave a large proportion of the impurities in the mercury unoxidized, in which case it is desirable first to oxidize with air and then to shake the metal with powdered charcoal which has been first impregnated with oxygen. After this has been done the charcoal will appear on the top of the mercury carrying all foreign matter and impurities in it.

Notes from Current Literature

Concerning Mining, Metallurgy and Industrial Chemistry

Filling Shrink Holes in Cast Aluminum

The following mixture is given in *Foundry*, October 1912, to fill shrink holes in cast aluminum: Aluminum, 1 part; zinc, 11; tin, 29; phosphor tin, 1 part. Melt in the order given. As soon as the aluminum castings are shaken out, examine for shrink holes and if found, rub a stick of solder in the hole until the hole is filled up. While the solder is still liquid, the surface of the casting underneath the solder, where the two metals are to be united, is scraped with any suitable tool, but care must be exercised that the surface being scraped in this way is entirely covered with the molten alloy to exclude the air, thereby preventing the formation of aluminum oxide. After the surface is nicely tinned, the casting is not disturbed until it has cooled sufficiently to permit the solder to solidify. We have soldered lugs on castings with this alloy, and have never had any difficulty with the joints after they have been made in this way. When using the solder in the usual way, it is necessary to tin the surface to be soldered, similar to the manner of tinning cast iron, by continual rubbing with the copper or by heating with a blow torch and by scraping as described for filling shrink-holes. If two pieces of aluminum are to be soldered together, both surfaces should be tinned and the pieces should be sweated together, as aluminum solder will not flow in a joint.

Vanadium in Pig Iron

That vanadium is a more common constituent of pig iron than is usually supposed is the view of Porter W. Shimer (*Bull.* A. I. M. E., August, 1912). In general, he states that the Lehigh Valley pig irons carry from 0.02 to 0.05% of vanadium, and 0.10 to 0.20% of titanium. These elements follow silicon, and a high-silicon, low-sulphur pig will carry a maximum of vanadium and titanium. These elements seem to be particularly high in irons reduced from magnetites, although this does not always follow.

In remelting, the loss seems to be about 14% of the vanadium present. The vanadium irons usually show a fracture of dull dark gray patches in a white network. Superficially the appearance is that of hard mottled iron, but the iron is really soft. The metals titanium and vanadium do not alloy with the iron, but apparently crystallize out as carbides before the iron has begun to solidify.

It is suggested that these carbides serve as nuclei for the rapid crystallization of the iron; in this way causing a finer grain, and consequent greater strength, than would be the case in the absence of these elements.

From Mr. Shimer's analyses it seems that vanadium should be looked for in pig oftener than it is.

Rockey-Eldridge Copper Refining Process

Walter S. Rockey and Hilliary Eldridge have patented a copper-refining process (U. S. pat. 1,037,538, assigned to Metallurgical Research Co.), in which the copper is melted in an oil blast furnace, or in some equivalent melter of high efficiency regardless of any contamination from furnace gases. From this furnace the molten metal flows through a bath of carbonaceous material, and from here through a bath containing anhydrous boron trioxide or its equivalent, with or without an admixture of carbon. The idea of the first bath is to remove the oxygen from the copper oxide, and of the second to remove foreign oxides and metals. Both of the purifying baths will require some external heating.

Uses of Electric Furnace Steels

In discussing P. Heroult's paper on the recent development of the electric steel furnace, before the Congress of Applied Chemistry, Mr. Rogers, of the American Steel & Wire Co. made the statement that it had tried the electric-furnace steels for many sorts of wire, ropes, music wire, hat wire, etc. The engineers had noted that apparently the electric-furnace steel is of greater density than openhearth, but that there seemed to be no great difference between the electric and basic openhearth steel, although apparently it was not quite so good as the acid.

In drawing wires, the hardness after each successive reduction seemed a little greater in the electric steels, but on "life" tests of the electric and ordinary openhearth wire there seemed to be no essential difference. They had much difficulty in getting the carbon low, and at the same time keeping the bath deoxidized in the electric furnace.

Mr. Brady, of the Illinois Steel Works, said he made electric steel from blown bessemer, putting the product into rails, and found it satisfactory. Mr. Speller, of the National Tube Co., stated it had used electric steel for seamless and welded tubes. It did well in the former, poorly in the latter. Dr. J. W. Richards said that a certain amount of included slag is necessary for a good weld, and that the poor results in welded tubes were due to lack of these inclusions.

He also stated that in Norway this last summer, he had seen electric furnaces working in conjunction with producer-fired melting furnaces, and that this combination was the most economical, although electric power was only $8 per horsepower-year, and coal (English) cost $4 per ton.

Assaying Cobalt Ores

In a paper before the International Congress of Applied Chemistry, J. O. Handy stated that he had had the greatest success with the crucible assay of Cobalt ores. For this he mixes up a "silver-ore flux": Na_2CO_3, 4 parts; K_2CO_3, 4 parts; $Na_2B_4O_7$, 2 parts. The charges are: Pulp, 0.2 a.t.; silver flux, 30 grams; litharge, 60 grams; flour, 1 gram; mixed on a rubber cloth, placed in a 30-gram crucible with a cover of eight grams of borax glass. The crucibles are heated at a medium red heat for 20 min. in a closed muffle, then the temperature is raised to bright yellow for 30 minutes.

The crucibles are poured into conical iron molds, the buttons hammered free from slag, and cupelled in single rows. The temperature is kept as low as possible, and feathers should form entirely around the button. After the blick, large buttons are covered with hot cupels. Small buttons are simply cooled slowly to avoid sprouting. Metallics are run separately by scorification, using a little borax and ground silica with the test lead.

High-grade Cobalt ores are assayed in the same way as the low, except that 90 grams of litharge are used instead of 60, and the metallics are assayed by crucible instead of by scorification assays. The charge is: Metallics, 0.5 gram; high-grade ore flux, 50 grams; flour, 1 gram.

In discussing this paper, Mr. Liddell said that many assayers had trouble with the wet assay of cobalt ores, apparently because of the precipitate of arsenious oxide, which settled on the beaker and

refused to be wiped off. This precipitate occludes silver compounds and the assay results are low. This could be avoided by a suggestion of A. M. Smoot, of Ledoux's laboratory, who treats the beaker with a caustic alkali, then neutralizes this solution with nitric acid, adds one drop of hydrochloric, and adds the resulting precipitate to the assay. Under these conditions he thought the wet assay easier to manipulate than the fire.

In response to a further remark of Mr. Liddell, Mr. Handy said he had been surprised that he was able to cupel the crucible buttons without first scorifying, but that such was the fact.

Ramage's Detinning Process

In the detinning process invented by Alexander S. Ramage, of Newark, N. J. (U. S. pat. 983,931, assigned to John S. Maugham), a solution of plumbate of soda is first prepared by boiling litharge or lead residues in sodium hydrate. The scrap to be detinned is then treated with this solution, dissolving the tin and leaving a flocculent lead precipitate floating in the solution. The tin scrap is preferably immersed successively in plumbate liquors of increasing strength. After stripping thoroughly, the detinned scrap is washed and baled.

The stannate solution is run through a centrifugal machine, and the spongy lead separated and washed. The stannate solution thence is run over galvanized scrap, dissolving the zinc and precipitating tin, which is held in suspension, and separated out later from the solution. The sodium zincate is then electrolyzed, using iron anodes and zinc-sheet cathodes, with a current of about 20 amp. per sq.ft. The zinc is not entirely precipitated, as it is not economical to throw down all of it.

The regenerated caustic-soda solution, containing a little sodium zincate, is then used to dissolve more lead oxide, to begin a new cycle of operations. The reactions all take place at about 180° Fahrenheit.

New Uses for Tungsten

Tungsten is finding an increasing use in the electrical arts outside its application in incandescent-lamp filaments, says the *Electrical World*. On account of its high surface tension, the metal is well adapted for sparking or arcing terminals. In some of the newer Crookes or X-ray tubes which are designed to work at enormous intensities, being capable of absorbing 10 kw. and taking "snapshot" skiagraphs of even the thickest parts of the human body, tungsten has been used as the anode target for the cathode rays, the rare metal being backed up with copper to convey away the heat developed. Although rendered molten by even this instantaneous impact of electrons, the great surface tension of the tungsten prevents its loss or change of shape. Tungsten electrodes have also been used for gas-engine spark gaps and show longer life than those of other metals of equivalent cost.

Melting Points of Fire Bricks

A complex substance such as a firebrick cannot be said to have any definite melting point, so for experiments on this point the U. S. Bureau of Standards defined the melting point as being the lowest temperature at which a small piece of brick could be distinctly seen to flow (*Technologic Paper, No.* 10).

The following melting points of important materials in the manufacture of firebrick were determined: Kaolin, 1740° C.; pure Al_2O_3, 2010°; pure SiO_2, 1750°; bauxite, 1820°; bauxite clay, 1795°; chromite, 2180° C. Silicon carbide begins to decompose at 2220° after prolonged heating, but does not melt at much higher temperatures with short heating.

Forty-one samples of fireclay brick were tested, the melting points of which as above defined, were from 1555° to 1725° C.; eight samples of bauxite brick had melting points from 1565° to 1785°; three of silica brick from 1700° to 1705°; one chrome brick gave 2050°, and one magnesia brick gave 2165° Centigrade.

It should be noted that the melting point of a brick is not the only property to consider in determining its fitness for any given purpose. Its crushing strength when cold, its behavior under load when heated, and its resistance to fluxes should all be noted.

Distinguishing Brass by Color

The composition of brass may be readily determined, approximately, by the color, says the *Brass World*, Sept. 1912. The following shows the color of the various percentages of copper and zinc:

When the brass contains 5% of zinc, it has a red color scarcely differing from that of pure copper. When 10% of zinc is present, the mixture has a true bronze color. With 15% of zinc, the brass has a light orange shade. When the amount of zinc reaches 20%, the color of the mixture is greenish-yellow and is known as "green brass." With 25% zinc, the color is practically that of the 20% mixture so that this, too, is a "green brass." Brass with 30% zinc has the true, yellow brass color. The same is found with 35% of zinc, but at about this point the yellow color begins to disappear, for at 40% zinc, a reddish yellow color is found. Brass, therefore, that has a reddish-yellow shade will always contain more than 35% zinc. The "dead line" seems to be about 38% zinc, for at this percentage, the transition from the real yellow to the reddish-yellow begins.

When the zinc is increased to 45%, the color of the brass is a rich golden color and, strictly speaking, it may be called "orange." The mixture containing 50% zinc has also a golden shade, but even richer than 45% zinc alloy. At 55% zinc, the color resembles that of 14-k. gold. When 60% of zinc is reached, the brass has a yellowish white shade, and as the quantity increases, the color becomes white and finally gray.

In comparing colors a highly polished surface is not so good as a dead one, for the reason that the reflections are likely to deceive the observer. A freshly cut surface is necessary in order to get away from the effects of tarnishing.

Colorimetric Iron Determination in Lead Products

A colorimetric determination of iron in lead or lead oxides is proposed by John A. Schaefer (*Journ. Ind. Eng. Chem.*, Sept., 1912). For litharge or metallic lead weigh out 1 gram of sample, add 15 c.c. of water and enough nitric acid to dissolve the lead as nitrate. With red lead add 10 c.c. of 1:35 hydrogen peroxide after action of the nitric acid has ceased to carry the lead peroxide into solution. Neutralize the solution with NH_4OH, then make faintly acid with HNO_3. If lead peroxide precipitates during neutralization, add a little more peroxide to clear the solution.

Wash the solution into a 100-c.c. Nessler cylinder, and add 15 c.c. of 1:20 ammonium-sulphocyanide solution, and dilute to the mark. As a standard for comparison use ammonium-ferrous-sulphate made by oxidizing 0.7022 gram of the salt in dilute sulphuric acid with permanganate until the pink barely shows, then diluting to 1 liter; 1 c.c. = 0.0001 gram Fe. Prepare the blank by placing in the Nessler 10 c.c. of 1:35 peroxide, the quantity of acid used to dissolve the lead, 15 c.c. sulpho-cyanate solution, dilute almost to the mark, and run in the ferric standard solution.

Color Reaction for Ammonia

A reaction for ammonia has been studied by P. Thomas (*Bull.* Soc. Chem., 1912, p. 796), which is said to be of equal sensitiveness to the Nessler test, and somewhat easier of execution. It depends on a discovery of Berthelot, that when an excess of phenol and a little sodium hypochlorite are added to a dilute solution of ammonium salt, a blue color develops. A 4% solution of phenol is used, and a comparison is made with a standard ammonium-chloride solution.

Argilite

Argilite is a new aluminum alloy, invented by Prof. Gaston Jacquier, says *Foundry*, October, 1912. It is claimed to be a hard, light alloy suitable for pipes, tubes, and armor plate, and to resist corrosion. Its composition is: Al, 90%; Bi, 2; Cu, 6; Si, 2 per cent.

Settling Slimes at the Tigre Mill

By R. T. Mishler *

Experiments indicate that the rate of settling of slimes is usually independent of depth of setting column. Extremely thick slimes are governed by different laws from those applicable to thin slimes. A formula is devised by means of which laboratory results may be used as a basis for mill design.

*Assistant manager, Tigre Mining Co., Yzabal, Sonora, Mexico.

While conducting some settling experiments on the slimes produced in the cyanide plant of the Tigre Mining Co., of Sonora, Mexico, some interesting principles of settling were observed which have not been recognized in any published article as far as I am able to ascertain. If these principles are as general as the results on the Tigre slimes seem to indicate, a few simple laboratory tests will provide the mill designer with a direct and reasonably accurate method of determining the settling equipment required for any special case.

Uniform Conditions For Tests

The tests used for the development of these principles were made on a variety of slimes, ranging from almost pure clay to comparatively clean, reground sand. The moisture ratios varied from 2 : 1 to 60 : 1. A fairly wide range was thus afforded on which to base any general conclusions. Table I gives a description of the various slimes used in the tests. An effort was made to keep the nature and temperature of the pulp and the percentage of lime and cyanide in solution the same in laboratory tests as they were in the cyanide plant. This gives additional meaning to the comparison of laboratory results with results obtained in actual practice.

For ease in calculation the degree of thickness of the different pulps is expressed in terms of the ratio by weight of liquid to slime (L:S ratio). In the formulas only the first character of the L:S ratio is used; for example, the thickness of a pulp with an L:S ratio of 15 : 1, is expressed by the figure 15. The rate of settling for both quiet and continuous settling is measured by the depth, in feet, of clear solution formed per minute. By the words "quiet settling," it is intended to distinguish undisturbed, intermittent settling in a decantation tank or laboratory vessel, from continuous settling in a mechanical or cone-bottom settling tank.

Settling of Dilute Slimes Is Independent of Column Depth

The effect of depth on the rate of settling of dilute slimes was first investigated. Table II gives the results of laboratory settling tests on three different slimes. In order that the deep columns should settle to the same final consistency as the shallow columns, the duration of the tests was made proportional to the depth. The table shows that in settling a dilute slime to a required degree of thickness, the average depth of clear solution formed per minute is virtually independent of the depth of the settling column.

The same principle is illustrated graphically in Figs. 1 and 2. Fig. 1 shows that at the beginning of the test the rate of settling was greater in the shallow than in the deep column. The settling rate in the deep column, however, increased as the test proceeded, thus equalizing the first advantage gained by the shallow column. The shape of the two curves is practically the same with the exception that the abscissas of the 24-in. column are three times the length of the corresponding abscissas of the 8-in. column. This further corroborates the principle that the average depth of solution formed per minute in settling between two degrees of thickness is virtually independent of the height of the settling column. With the L:S ratio of the thickened pulp plotted as abscissas and the settling rate plotted as ordinates, as in Fig. 2, the two curves practically coincide.

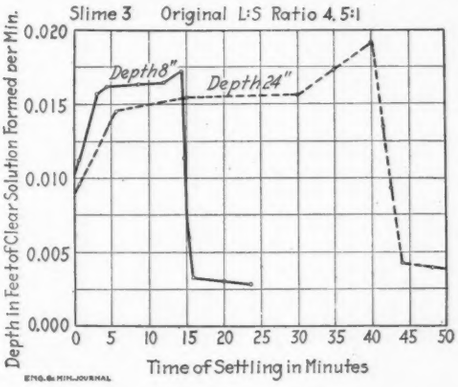


FIG. 1. EFFECT OF DEPTH ON RELATION BETWEEN RATE OF SETTLING AND DURATION OF TEST

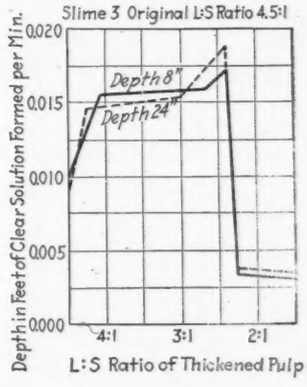


FIG. 2. EFFECT OF DEPTH ON RELATION BETWEEN RATE OF SETTLING AND DILUTION OF THICKENED PULP

Table III gives the results of a series of laboratory tests to determine the effect of depth on the continuous settling of slimes. It will be noticed that with the exception of very shallow depths, the volume of overflow per min. is independent of the depth of the vessel. Test F of Table III shows that the low rate of settling for shallow depths may be overcome by the proper distribution of the feed.

The above experiments indicate that in settling a dilute slime to a desired degree of thickness, the average rate of settling is virtually independent of the depth of the settling column.

Depth of Column Not Controlling Factor

As a corollary to this principle, it may be stated that the depth of the settling column has virtually no influence on the settling efficiency of dilute slimes. In a recent article, some radically different inferences were drawn from similar tests, these inferences being based on the assumption that the efficiency of settling should be determined by dividing the volume of clear solution formed in a given time, by the original volume of pulp in the settling tank. This assumption is misleading. For example imagine two continuous settling tanks of the same diameter, one 5 ft. high and the other 10 ft. high, both receiving the same nature and quantity of feed per day. Table III indicates that the same volume of overflow would be secured from the low tank as from the high one, providing the feed of the low tank was properly distributed. If we accept the assumption that the efficiency may be measured by dividing the volume of overflow by the volume of pulp in the tank, the 5-ft. tank would show twice the efficiency of the 10-ft. tank. This, however cannot be the case. Both tanks receive the same feed per day, produce the same volume of clear solution per day, and yield the same volume per day of pulp thickened to the same consistency. Therefore the efficiency cannot be otherwise than the same.

Parallel conclusions may be drawn for the case of quiet settling. Imagine the two tanks of the preceding

paragraph working intermittently as decantation tanks. It may require 5 hr. of quiet settling in the tank 5 ft. deep in order to produce pulp of a desired degree of thickness. At the end of the 5 hr., the volume of clear liquid decanted from the 5 ft. tank might easily be the same as would be decanted from the 10-ft. tank in the same length of time. Under these conditions, the assumption of the preceding paragraph would lead us to suppose that the shallow tank was doubly as efficient as the deep tank. This, however, is not the case. The 5-ft. tank must be discharged and refilled at the end of 5 hr., and again discharged at the end of 10 hr. The 10-ft. tank handles the same amount of feed in one operation. Table II and Figs. 1 and 2 show that in 10-hr. both tanks would produce the same volume of clear liquid and yield the same volume of pulp thickened to the same consistency. The settling efficiency of the two tanks must therefore be the same.

TABLE I. DESCRIPTION OF SLIMES TESTED

Slime No.	Origin	Nature	Sp. Gr. of Dry Slime	—200 mesh %	Solution	
					KCN %	CaO per ton lb.
1	Overflow from overloaded continuous thickeners	Principally flocculant particles of clay	2.625	98	tr	0.1
2	Overflow from classifiers handling tailing from concentrating plant	Mixture of slime No. 1 with fine particles of sand	2.628	90	tr	0.1
3	Overflow from classifiers handling reground sand from tube mills	Principally sand	2.640	80	0.16	2.0
4	Average pulp after receiving 48-hr. treatment in air agitation tanks	Mixture of slimes Nos. 1, 2 and 3	2.635	85	0.17	1.9

TABLE III. EFFECT OF DEPTH ON RATE OF CONTINUOUS SETTLING OF THIN SLIME

Test	Slime No.	Depth of column ft.	Duration of test. min.	*L:S* ratio		Total cu.ft. of feed	Total cu.ft. of overflow	Cu.ft. feed per min.	Cu.ft. overflow per min.
				Feed	Discharge				
A	3	1.4	77	5:1	3.5:1	3.60	1.07	0.047	0.0139
B	3	0.7	33	5:1	3.5:1	1.58	0.46	0.048	0.0139
C	1	1.4	53	24:1	17:1	1.12	0.35	0.021	0.0066
D	1	0.7	65	24:1	17:1	1.57	0.44	0.024	0.0068
E	1	0.35	20	24:1	20:1	0.52	0.095	0.026	0.0047
F	1	0.35	10	24:1	16:1	0.19	0.064	0.019	0.0064

Continuous settler made from glass carboy, 2 ft. high by 1.15 ft. diam., provided with subsurface feed and overflow launder of adjustable height. Slime level kept 0.15 ft. below overflow level. The first five tests were conducted with one subsurface feed, near center of vessel. Test F was conducted with three subsurface feeds near periphery of vessel.

Settling Efficiency Proportional To Clear Liquid Formed in Unit Time

From the above illustrations, it appears that if it is desirable the settling efficiency may be determined by dividing the volume of clear liquid formed in a given time, by the average volume of feed during that time, but that it is erroneous to consider the settling efficiency as proportional to the quotient obtained by dividing the volume of liquid formed in a given time by the original volume of pulp in the tank. To me it appears that the simplest and most logical manner of determining settling efficiency is to regard it as proportional to the volume of clear liquid formed per unit of time.

The preceding paragraphs indicate that the settling efficiency of dilute slimes would be virtually the same in very shallow tanks as in the comparatively deep tanks used at the present time. Practically, however, tanks of reasonable depth have certain advantages over more shallow ones. In shallow, intermittent settling tanks, much time would be lost in frequent changes of pulp. In shallow, continuous settling tanks, difficulty would be experienced in properly distributing the feed and in properly regulating the underflow. For these reasons shallow settling tanks of either type would require more attention than do the comparatively deep tanks used at present. In cyanide plants, deep settling tanks have the additional superiority of prolonging the duration of treatment in proportion to their depth. On the other hand shallow tanks would have the advantage of less first cost and also the advantage of using up less of the available fall about a plant. It thus appears that the matter of depth is a question of expediency rather than of settling efficiency.

Thick Slime Subject to Different Law

The principle that the rate of settling is independent of the depth is not true for excessively thick slime. Table IV gives the results of a series of laboratory tests, showing the effect of depth on the settling rate of thick slimes. The table shows that as a rule, the settling rate of thick slimes increases with the depth of the settling column. It also indicates that, for each depth, there is a critical dilution at which a slight increase in the *L:S* ratio causes a large increase in the rate of settling. When the dilution is greater than the critical

TABLE II. EFFECT OF DEPTH ON RATE OF SETTLING OF THIN PULPS

Height of settling column in feet	Duration of test in minutes	L:S Ratio		Depth of clear solution at end of test feet	Depth in feet of clear solution formed per minute
		Beginning of Test	End of Test		
		Slime No. 1			
0.66	10	10:1	9.2:1	0.05	0.005
1.33	20	10:1	9.2:1	0.11	0.005
2.00	30	10:1	9.2:1	0.16	0.005
0.66	10	30:1	24.9:1	0.11	0.011
1.33	20	30:1	24.8:1	0.23	0.011
2.00	30	30:1	25.2:1	0.37	0.012
0.66	10	60:1	24.0:1	0.39	0.039
1.33	20	60:1	24.7:1	0.76	0.038
2.00	30	60:1	26 7:1	1.09	0.036
		Slime No. 2			
0.66	10	8.5:1	7.9:1	0.04	0.004
1.33	20	8.5:1	7.9:1	0.09	0.004
2.00	30	8.5:1	7.9:1	0.13	0.004
0.66	10	15 :1	13.1:1	0.08	0.008
1.33	20	15 :1	13.1:1	0.17	0.008
2.00	30	15 :1	13.1:1	0.23	0.008
0.66	10	25 :1	18.2:1	0.18	0.018
1.33	20	25 :1	18.2:1	0.35	0.018
2.00	30	25 :1	18.3:1	0.52	0.017
		Slime No. 3			
0.66	10	3.0:1	2.2:1	0.15	0.015
1.33	20	3.0:1	2.2:1	0.28	0.014
2.00	30	3.0:1	2.3:1	0.41	0.014
0.66	10	4.5:1	3.1:1	0.18	0.018
1.33	20	4.5:1	3.2:1	0.38	0.019
2.00	30	4.5:1	3.2:1	0.52	0.017
0.66	10	7.0:1	4.2:1	0.25	0.025
1.33	20	7.0:1	4.2:1	0.50	0.025
2.00	30	7.0:1	4.3:1	0.74	0.025

Quiet settling in a glass cylinder 2.3 ft. high by 0.1 ft. diameter.

TABLE IV. EFFECT OF DEPTH AND INITIAL THICKNESS OF PULP ON SETTLING RATE OF THICK SLIMES

Slime No.	Initial *L:S* ratio	Final *L:S* ratio	Depth in ft. of clear solution formed per min.		
			Depth of column ½ ft.	Depth of column 1 ft.	Depth of column 2 ft.
4	1.9:1	1.8:1	0.0001	0.0001	0.0002
4	2.1:1	2.0:1	0.0002	0.0002	0.0004
4	2.7:1	2.6:1	0.0002		0.0009
4	3.2:1	3.0:1	0.0003	0.0004	0.0012
4	3.6:1	3.4:1	0.0004		0.0045
4	4.5:1	4.3:1	0.0009	0.0031	0.0072
4	4.7:1	4.5:1	0.0013		0.0073
4	5.0:1	4.7:1	0.0014	0.0067 0.0090	0.0087
4	6.5:1	6.2:1	0.0092	0.0092	0.0090
1	6.0:1	5.7:1	0.0001	0.0001	0.0001
1	8.0:1	7.6:1	0.0002	0.0003	0.0004
1	9.0:1	8.5:1	0.0007	0.0021	0.0042
1	12.0:1	11.4:1	0.0009	0.0087	0.0092
1	14.0:1	13.3:1	0.0032	0.0092	0.0094
1	17.0:1	16.1:1	0.0067	0.0095	0.0092

Quiet settling in glass cylinder 0.1 ft. diam. Each test made by noting time required to form a volume of clear solution equal to 1/20 part of the original volume of pulp. Below the broken lines the slime begins to follow the principles of settling for thin slime.

point the rate of settling is not increased by a further increase in depth, the settling thus following the principle for dilute slimes. It further appears that as the depth of the settling column is increased the $L:S$ ratio corresponding to the critical dilution is decreased; likewise, as the depth is increased there is a less noticeable decrease in the settling rate at the critical point. It is reasonable to suppose that for the comparatively deep tanks used in actual practice, the critical dilution would entirely disappear and there would be only a gradual decrease in the settling rate as the initial $L:S$ ratio is decreased. In other words, in tall tanks the relation between settling rate and initial dilution of thick slimes might be expressed graphically by a straight line. This principle will be used later in this article and will be shown to give results approximating actual practice closely.

It was further observed that a slime, which was too thick to permit the classification of the fine sand particles, settled to a much greater degree of thickness in 24 or 48 hr. of quiet settling, than did the same slime, when settling from a dilution which was thin enough for the sand particles to separate. This observation may prove useful in cases where it is desired to secure a very thick pulp.

TABLE V. RATE OF QUIET AND CONTINUOUS SETTLING OF THIN SLIME IN LARGE TANKS COMPARED WITH SETTLING RATE AS DETERMINED IN LABORATORY TESTS

	Original $L:S$ ratio	Duration of test min.	Total depth of clear solution formed ft.	Depth of clear solution formed per min. ft.
24x6 ft. Vert. 45° cone bottom tank settling slime similar to No. 2 but containing larger proportion of fine sand and concentrate.				
Continuous settling in tank	9.5:1	60	0.45	0.0075
Quiet settling in laboratory	9.5:1	10	0.081	0.0081
Same tank as above settling slime containing larger proportion of clay.				
Continuous settling in tank	10 :1	30	0.188	0.0063
Quiet settling in tank	10 :1	60	0.425	0.0071
Quiet settling in laboratory	10 :1	10	0.061	0.0061
11x10 ft. Vert. 45° cone bottom tank settling slime similar to No. 1.				
Continuous settling in tank	24 :1	20	0.168	0.0084
Quiet settling in tank	24 :1	100	0.768	0.0077
Quiet settling in laboratory	24 :1	10	0.082	0.0082

Laboratory tests made in glass cylinder 2 ft. high by 0.1 ft. diam. Continuous settling test made by first lowering surface of solution 1 ft. below overflow level, then regulating the underflow to maintain pulp level at constant height and measuring depth of clear solution formed per minute.

Rising Liquid Prevents Settlement of Surface Slime

In making the tests on dilute slime, it was noticed that the slime particles were more or less separate and held in suspension in the liquid. The thickening of the pulp began in the bottom of the vessel, and the liquid which was set free arose between the suspended particles higher up, thus preventing thickening in the upper part of the vessel. It appears that only a limited amount of liquid can filter between the suspended particles without carrying them upwards. This seems to be the reason why the settling rate of dilute slimes is independent of the depth.

The settling of excessively thick slime, on the other hand, appeared to be caused by the contraction of the spaces between the particles, due to cohesion. A system of cracks was formed, which ultimately developed into channels, through which the clear liquid reached the surface. The liquid coming from the lower part of a deep vessel had a tendency to open up the channels in the upper part of the vessel, thus facilitating settling near the surface. This was especially noticeable at the critical dilution and explains why, at this point, an increase in depth caused a large increase in the settling rate. Occasionally at the critical dilution the settling rate in the deeper columns was found to be greater than it was for the same slime when slightly more dilute. The reason for this appeared to be that at the critical point the liquid arose through the channels, without greatly disturbing the surface. When the same slime was more dilute, the upward current of liquid became so great that the particles in the upper part of the column were thrown into suspension, and the rate of settling was limited by the amount of liquid which could filter between the suspended particles, as was the case with dilute slimes.

The previous paragraphs indicate that in most cases of settling of slimes the settling efficiency may be regarded as independent of the depth. Previous writers have shown that the settling efficiency is practically proportional to the settling area. If these principles are true, the settling rate of a given pulp should be the same in a small laboratory vessel as in large settling tanks. In order to check this deduction, a series of parallel tests was made in settling tanks and laboratory vessels. The results of these tests are given in Table V. In making experiments on quiet settling, the duration of the tests was timed so that the final dilution of pulp would be roughly the same in laboratory tests as in actual practice. An examination of the table shows that the rate of continuous settling appears to be slightly less than the rate of quiet settling. It also appears that the rate of settling, as determined in the laboratory, could be used with a fair degree of accuracy, to represent the rate of either continuous or quiet settling, in tall tanks.

TABLE VI. RATE OF CONTINUOUS SETTLING OF THIN SLIME FOR VARIOUS DILUTIONS OF FEED COMPARED WITH THE CORRESPONDING RATES OF QUIET SETTLING IN LABORATORY TESTS

	Actual Practice						Laboratory test (From Fig. 3)
Days averaged	R_1 $L:S$ ratio of feed	R_2 $L:S$ ratio of underflow	F Tons of dry slime per 24 hr.	$F(R_1-R_2)$ Tons overflow per 24 hr.	$S=0.0000-4912\,F(R_1-R_2)$ Depth in ft. of clear solution formed per minute		Depth in ft. of clear solution formed per minute
6	3.9	2.1	155	279	0.014		0.016
2	4.0	2.3	156	265	0.013		0.017
3	4.2	1.9	136	313	0.015		0.017
3	4.3	2.2	161	338	0.017		0.017
1	4.4	1.6	163	456	0.022		0.018
3	4.5	2.0	162	405	0.020		0.018
2	4.6	1.9	161	435	0.021		0.019
1	4.7	2.2	153	383	0.019		0.019
3	4.8	2.7	161	338	0.017		0.020
3	5.0	2.4	137	356	0.017		0.020
1	5.1	2.1	161	483	0.024		0.021
1	5.3	1.9	165	561	0.028		0.022
5	5.5	2.6	150	435	0.021		0.023
4	6.0	2.7	134	442	0.022		0.024
2	6.5	2.8	150	555	0.027		0.027
7	7.0	3.2	115	437	0.021		0.030
2	8.0	3.1	128	627	0.031		0.035
Average	5.27	2.45	145.4	410	0.020		0.022

Results of continuous settling are from daily samples over a period of 49 days in a 12x24-ft. mechanical settler, treating slime No. 3. Laboratory tests, of 10 min. duration each, were made in glass cylinders 2 ft. high by 0.1 ft. diameter.

TABLE VII. RATE OF CONTINUOUS SETTLING FOR VARIOUS DEGREES OF THICKNESS OF FEED COMPARED WITH THE CORRESPONDING RATES OF QUIET SETTLING IN LABORATORY TESTS

	Actual practice						Laboratory tests. (From Fig. 3).
Days averaged	R_1 $L:S$ Ratio of feed	R_2 $L:S$ Ratio of underflow	F Tons dry slime per 24 hr.	$F(R_1-R_2)$ Tons overflow per 24 hr.	$S=0.00009-88\,F(R_1-R_2)$ Depth in ft. of clear solution formed per minute		Depth in ft. of clear solution formed per minute
1	1.7	1.5	153	31	0.0008		0.0007
1	1.8	1.7	153	15	0.0004		0.0011
2	1.9	1.75	153	23	0.0006		0.0015
2	2.0	1.7	167	50	0.0012		0.0020
4	2.1	1.65	197	89	0.0022		0.0024
6	2.2	1.66	182	98	0.0024		0.0028
5	2.3	1.8	179	90	0.0022		0.0031
7	2.4	1.74	183	121	0.0030		0.0035
8	2.5	1.8	231	162	0.0040		0.0039
10	2.6	1.82	221	172	0.0042		0.0042
12	2.7	1.87	225	186	0.0046		0.0045
17	2.8	1.94	224	192	0.0047		0.0048
9	2.9	2.1	219	175	0.0043		0.0051
3	3.0	1.9	241	265	0.0065		0.0054
1	3.1	2.1	240	240	0.0059		0.0057
2	3.2	2.25	224	213	0.0052		0.0060
Average	2.55	1.83	208	150	0.0037		0.0040

Results of continuous settling are from daily samples over a period of three months, in two 12x24-ft. mechanical settling tanks treating slime No. 4. Initial $L:S$ ratio in laboratory tests correspond to $L:S$ ratio of feed in continuous settling.

Law Expressed in Formula

This last principle may be used advantageously by the mill designer. With the settling rate approximately established by laboratory test, a simple mathematical formula gives the relation existing between the thickness of feed and discharge, tons of feed, tons of clear solution produced, and the settling area necessary to secure any of these relations.

Let S = Rate of settling, expressed in terms of depth in feet of clear solution formed per minute.

Let F = Feed of dry slime, expressed in tons per 24 hr.

Let A = Settling area, expressed in sq.ft.

Let $R_1 = L:S$ ratio of feed. (6:1 expressed by the figure, 6).

Let $R_2 = L:S$ ratio of discharge (expressed as above).

Then:

Tons per day of clear solution $= F(R_1 - R_2)$.

Cubic feet of clear solution per min. $=$

$$\frac{32\,F\,(R_1 - R_2)}{1440} = 0.0222\,F\,(R_1 - R_2)$$

Depth in feet of clear solution formed per min. $=$

$$\frac{0.0222\,F\,(R_1 - R_2)}{A} = S \quad \text{(formula No. 1)}$$

Transposing;

$$A = \frac{0.0222\,F\,(R_1 - R_2)}{S} \quad \text{(formula No. 2)}$$

In Fig. 3, are plotted the settling rates corresponding to a series of original dilutions of the four principal slimes produced in the Tigre mill. The base of each curve represents the thickness of the slime after settling 24 hr. From this point a straight line was drawn to the point on the curve corresponding to the test in which classification of the sand particles was first observed. This straight line closely approximates the rate of settling of thick slimes in actual practice. Laboratory tests, shown by the dotted lines, indicate a much lower settling rate. The curves shown in Fig. 3 may be termed "settling curves." Tests at the Tigre mill indicate that with the settling curve of a slime determined by laboratory tests, any problem of settling pertaining to that particular slime, may be solved with a reasonable degree of accuracy. To illustrate, it may be desired to determine the diameter of a continuous settling tank, capable of handling 145.4 dry tons per day of pulp No. 3. The slime ratio of the feed is supposed to be 5.27 : 1, and the desired thickness of pulp in the underflow corresponds to the L:S ratio of 2.45 : 1. An inspection of the settling curve for Slime No. 3 (Fig. 3), shows that it is possible to secure a final moisture ratio of 2.45 : 1. The same curve gives 0.022 feet per minute as the settling rate corresponding to an initial L:S ratio of 5.27 : 1. Substituting these values in formula 2;

$$A = \frac{0.0222 \times 145.4\,(5.27 - 2.45)}{0.022}$$

$$= 414\ sq.ft.$$

The diameter of a tank, whose area is 414 sq.ft., is 23 ft. In actual practice at the Tigre mill, a mechanical settling tank, 24 ft. dia., does exactly the work outlined above. It thus appears that a close approximation of actual results may be secured by the use of the settling curve and formula. The tons feed, or the final degree of thickness, obtainable with a fixed settling area, may be calculated in like manner.

Settling Rate of Slime Depends on Dilution

The calculations given above are based on the principle that the settling rate of a given slime depends primarily on the dilution of the feed. To further check this principle and to prove that the settling rate corresponding to any dilution of feed may be determined by laboratory tests, daily moisture samples were taken, over a period of several weeks, from the feed and discharge of two mechanical, continuous settling units. The rate of settling for each dilution of feed was calculated from formula No. 1. On days having the same value of R_1 (dilution of feed), the values of F (tons feed per day) and R_2 (dilution of discharge) were averaged. The settling rates thus obtained, were then compared with the corresponding rates given in the settling curves. Table 6 shows the results in a single 24-ft., mechanical thickener, treating dilute slime, and Table 7 shows the results in two 24-ft., mechanical thickeners, acting as a single unit and treating extremely thick slime. The results of actual practice are slightly erratic, due to irregularities in sampling and to changes in the nature of feed from day to day. It will be noticed however, that there is a marked increase in the settling rate as the dilution of feed is increased: Likewise that the average result obtained in actual practice corresponds closely with the laboratory results taken from the settling curves. It would be interesting and useful if similar comparisons might be made in other plants, in order to prove whether the method outlined above may be used universally in solving the settling problems which confront the mill designer.

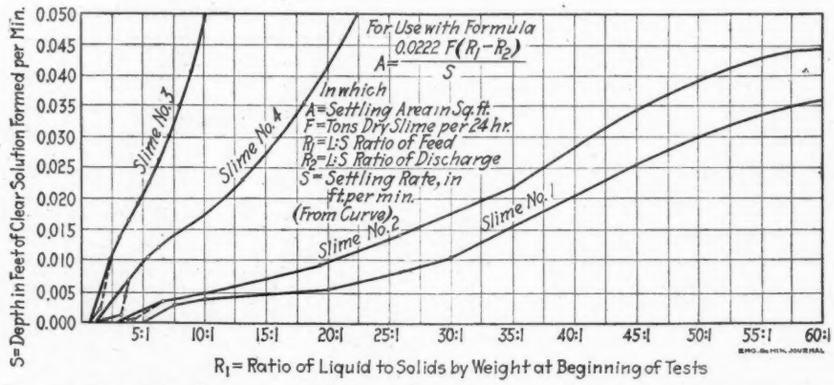


Fig. 3. Settling Curves on Various Dilutions of Each Pulp Settled 10 Min. in Glass Cylinder 2 ft. High by 0.1 ft. Diameter

U. S. Fluorspar Production

Last year the total quantity of domestic fluorspar reported to the U. S. Geological Survey as marketed in the United States was 87,048 short tons, compared with 69,427 short tons in 1910, an increase of 17,621 short tons. The production in 1911 was the largest ever recorded, 62,825 short tons of domestic gravel spar being marketed, against 52,013 short tons in 1910. The highly satisfactory condition of the fluorspar industry in 1911 was due partly to the ability of American producers to meet the demand more nearly than heretofore and to produce a better and more uniform grade of gravel spar than can be obtained by importation, and partly on account of the import duty of $3 per ton.

Fluorspar is used in the manufacture of glass and of enameled and sanitary ware, the electrolytic refining of antimony and lead, the production of aluminum, the manufacture of hydrofluoric acid, and in the iron and steel industries, where it is used as a flux in blast furnaces and in basic openhearth steel furnaces. It is estimated that about 80% of the American fluorspar output, mainly in the form of gravel spar, is consumed in the manufacture of basic openhearth steel. The use of fluorspar is increasing in practically all these industries.

While the United States imported over 50,000 tons of tin in 1911, valued at $43,346,394, this country produced but 63 tons of metallic tin from tin ore mined in its boundaries, according to the U. S. Geological Survey; detinning plants, however, recovered 14,706 tons.

German Electric Mine Locomotives

By A. Gradenwitz*

The general practice at German mines is to generate three-phase current at the surface and convert it to direct current at 250 to 500 volts underground. Single-phase locomotives are sometimes used. Accumulators or storage-battery locomotives are used where overhead wires or third-rail conductors are not feasible. Automatic accumulator locomotives serve for auxiliary haulage. Relatively low operating cost of electric-locomotive haulage has favored its adoption.

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Electric locomotives intended for mining work obviously have to comply with conditions entirely different from those of other locomotives. A locomotive for underground traction was developed in Germany at a comparatively early stage of electrical engineering.

Factors Affecting Underground Design

The main factors to be considered were: The narrow gage, sometimes as small as 450 mm., which determines the output of the motor mounted between the wheels; the section of the tunnels, the height and width of which sometimes restrict the overall construction to given dimensions; the small carrying capacity of the underframe which makes low wheel pressure and slow speed desirable, and finally the conditions generally prevailing in a mine, which call for an adequate protection against dirt, moisture, and rough handling. A locomotive which may be taken as typical of the best German practice, is shown in one of the accompanying halftones. All parts lie inside the cast- or wrought-iron frame and are thus protected from injury which might otherwise be caused by objects accidentally projecting into the locomotive profile.

The wheel axles are made of Siemens-Martin steel, the wheel centers being of cast iron with steel tires, which can be replaced when worn. The bearings consist of strong cast-steel cases with dust-tight covers. The bearing bushes, which can be readily exchanged, are made of gun metal and are rigidly fixed in the bearing supports. A grease box is provided for lubrication, which is filled through an opening in the bearing box. This grease box contains a lubricating pad, which is pressed against the axle journal by springs. The frame is supported on the axle bearings by leaf springs, special precautions being taken to prevent these springs from being displaced. Among other mechanical equipment are: A powerful quick-acting hand brake, which can be released immediately by a pedal; a sand-strewing device, and a signal gong.

The motors are the totally inclosed series type, running at a low speed; they are mounted on the axles and are spring-suspended from the frame. They drive the axles from single-reduction gearing, which is likewise inclosed. The motors are regulated by a controller in conjunction with resistances. The speeds are so designed that after the starting period both motors are connected in parallel, when running upon the track, and give their full output at a predetermined speed. On the other hand, for shunting service the motors are connected in series, receive only half the voltage and run at half speed. An automatic main-current switch and a main fuse prevent dangerous overloading of the motors. The lamps for the headlights are connected with a branch circuit, which is also protected by fuses. A wall socket allows a hand lamp to be used, which facilitates the inspection of the interior of the locomotive.

The current is received, in the majority of mining installations, through an overhead contact line, the return current being sent through the rails. A three-phase plant is installed in most generating stations for mining services; it is generally converted underground to continuous current, which is then led to the contact line at a tension of from 250 to 500 volts.

Small bows are used for the current collectors, which reverse automatically according to the direction of travel, when the overhead contact wire is laid at an approximately uniform height. If the height varies considerably, or if it is necessary to protect the contact line at low points by a wooden covering, trolley collectors are most suitable, and this form must also be used for double-pole overhead lines. For heavy currents, such as are necessary for the 125- and 250-hp. locomotives employed in ore mines, for example, it is advisable to adopt a pantograph-roller collector, similar to that shown in the first halftone. As may be seen, these heavy locomotives differ appreciably in other respects also from the form of construction previously described.

The lower part is constructed with a double frame of sheet metal 20 mm. thick. The locomotive can be controlled and braked from either end. As the locomotives also work in the open air, the driver's seat is completely inclosed. Removable covers facilitate access to the motors. The four-axle locomotives consist of 2 two-axle locomotives coupled together, each of which has a driver's cab. In order to avoid the construction of two driver's cabs, the more recent forms of heavy locomotives have been constructed with one central seat.

High-power Electric Mine Locomotives with Pantograph-roller Collectors

The construction of single-phase railways above ground and the successful results obtained with them, have naturally led to the designing of single-phase railways underground. The conditions for the latter, however, are much less favorable. The chief advantage, namely, that of using pressures from 5000 to 6000 volts, no longer comes into question for underground service, where only pressures from 250 to a maximum of 500 volts are permissible. Further, the volt-

age drop is so great on single-phase lines in consequence of the induction, that in most cases it is necessary to lay special feeder cables. In consequence of the feeder cable and the transformer stations along the track, the installation costs are usually as high as for a plant with a converter station.

Accumulators Sometimes Used

In cases where, for any reason, it is not permissible to lay an overhead line, the employment of accumulators may be considered. Since special charging stations have been provided for charging the batteries instead of charging them from the overhead line, excellent results have been obtained with the transportable batteries. The equipment consists of the charging station and the locomotives. As a locomotive can seldom make a sufficiently long pause to allow a fixed battery to be recharged, the batteries are made interchangeable, two or more batteries being usually provided for each locomotive.

In order to effect a saving in running expenses in cases where the haulage is intermittent, the Allgemeine Elektricitäts Gesellschaft has recently constructed automatic accumulator locomotives. As the name implies, this type of locomotive travels without a driver. The controller is operated by means of a long wooden bow which projects about one meter in front of the locomotive. If the bow comes in contact with any obstruction on the track, it is pushed inward, and thus switches the motor out, applying the brake at the same time. For traveling in the opposite direction the bow must be reversed. Various ingenious and simple devices for the setting of the points by the locomotive, and for the mutual protection of the trains, enable the locomotive to run by itself, to a given place, after the current has been switched on, and thus the service is completely automatic. The locomotives at present constructed weigh 1.5 to 2.5 tons, and draw trains of 10 to 15 trucks in coal mines at a speed of one meter per second.

Automatic Locomotives as Auxiliaries

The accumulator locomotives of all sizes can be constructed entirely explosion proof, and may, therefore, be used wherever danger of firedamp exists. Although the driverless locomotives seldom come into question for main haulage, they are of great importance for auxiliary service and for side tracks, as they can travel over any track over which trucks run.

In order to avoid the necessity of laying overhead lines in side tracks which are only used temporarily, the locomotives intended for this service are equipped with a cable drum. Before the locomotive leaves the overhead contact line, the flexible cable is hooked on behind one of the contact line clamps. The locomotive is now able to travel for a further distance of about 150 m. A small electric motor which is coupled to the cable drum, is constantly under current. It holds the cable tight as it runs out, and winds it up again at the necessary speed on the return journey.

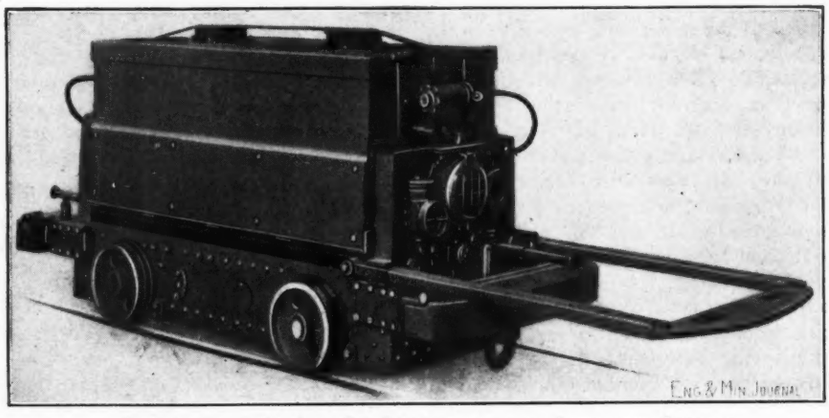
If the gradients of the side tracks are so steep that it is no longer economical for the locomotive to travel over them, the cable drum is replaced by a winding drum which is mounted on the locomotive and enables the driver to draw in trucks from a distance of about 100 meters.

Working Costs Low

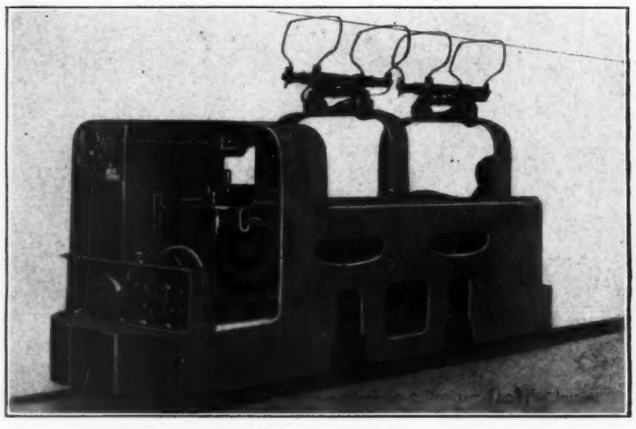
The final decisive factor for the introduction of electric haulage is the working costs. Great reliability in working with simplicity of operation, unsurpassed adaptability to any conditions, facility in the extension of existing plants, all these obvious advantages would not have led to such a rapid introduction of electric-locomotive haulage in all branches of mining, if at the same time the working costs had not been reduced to such an extent that large plants could be written off in a few years solely from the economy effected as compared with previous costs.

The working costs for a mine railway, which consists of interest and writing off of capital costs, expenses for wages, maintenance of plant, and the cost of current and material, can only be determined for a new installation, by the preparation of a detailed estimate and by giving due consideration to all the important factors.

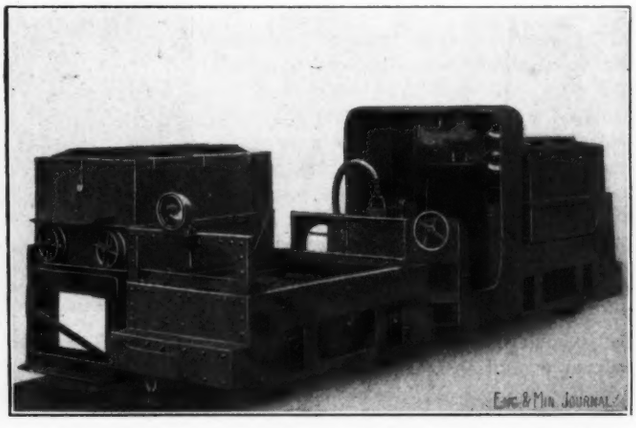
If approximate values are required for general preliminary purposes, the following figures may be taken under ordinary conditions: Working costs for continuous-current locomotives with overhead contact line, 0.5 to 0.65 pence per ton-mile; for single-phase locomotives with overhead contact line, 0.5 to 0.65 pence per ton-mile; for accumulator locomotives, 1 to 1.15 pence per ton-mile.



Automatic Accumulator Locomotive for Auxiliary Service



Typical Electric Mine Locomotive with Bow-collector



Accumulator Type of Locomotive Used in German Mines

Notes on Bag Filtration Plants

Anton Eilers, discussing bag filtration of fumes before the recent Congress of Applied Chemistry, said that it is not a paying process on furnaces carrying low-grade charges, except indirectly in stopping law suits, but is highly profitable on converters treating leady mattes.

Note—An abstract of a paper by Anton Eilers, read before the International Congress of Applied Chemistry (Vol. III, Proceedings), Sept. 4 to 13, 1912.

Up to about 25 years ago, the baghouse was only employed in producing zinc oxide. The first lead-furnace baghouse was erected in 1887 by the Globe Smelting Co., of Denver, Colo., but owing to hot furnace tops and too short flues, the bags often caught fire, and the experiment was not imitated for many years.

Owing to the increase of sulphide ores, resulting in increased roasting and consequent heavy losses, about 1902 experiments were made by the American Smelting & Refining Co., and it was found that with sufficiently large flues of a length from 1000 to 1800 ft., that there was no difficulty making the bags last. Most of the silver and gold settles in the flues, but there is much lead fume which would be lost without a baghouse or some spraying apparatus.

Two typical plants were selected for description. One treats an ore charge carrying 10 to 12% Pb, much moisture, and up to 4%S; the other treats refinery slags, leady copper mattes, and the ores necessary for slag making. The furnace charges in this case are often over 40% in lead, and rather low in the precious metals. The same plant also converts lead-copper matte to blister copper. A separate baghouse is provided for this operation.

The Murray Baghouse

The Murray baghouse was put into service July 7, 1907. Its cost was $127,195, including the cost of 4032 cotton bags, of distributing flue the entire length of baghouse, one 15x6-ft. Buffalo Forge fan, one 100-hp. motor, fan house, small bath house, and about 100 ft. of 17x16-ft. brick flue to connect with blast-furnace flue.

The outside dimensions of the baghouse are 216 ft. 6 in. by 90 ft. 6 in., height to roof trusses being 51 ft. 6 in. Construction is of brick, the outside wall being 21 in. thick for a height of 16 ft., then reduced to 17 in. for 18 ft., and 13 in. for the remaining 17 ft. 6 in. There are 24-in. brick buttresses projecting 4 ft. at floor line and tapering to about one foot at the roof-truss line, to stiffen the walls. Fifteen buttresses are built on each side of the building and five on each end.

Roof Construction

The original roof commenced to leak after a few months, due to the corrosion of the brads holding the elaterite roofing in place. After two years the nails holding the 1-in. board sheeting were eaten to such an extent thata a heavy wind blew about one-third of the roof off from one compartment, and it was evident that nails could not be depended upon for holding the roof down. In the early part of 1910 a new roof was put on top of the old roof in No. 1 compartment, allowing an airspace between the two roofs. On top of the old roof 2x4-in. battens were laid at 3-ft. centers, 1-in. sheeting was then nailed on and elaterite roofing with horizontal seams nailed to this, allowing a lap of about 4 in.; 2x2-in. battens, spaced 3-ft. centers, were put on top of the elaterite roofing and the two roofs were bolted to the 6-in. channel purlins. To give added strength, 3x6-in. pieces, 3 ft. long, were put on the 6-in. channels, between rafters, the 2x4-in. and 2x2-in. battens coming directly on top of these and bolts going down through them. This roof has been in use for over two years and is in excellent condition. The air space appears to prevent any condensation and keeps bags drier than in other compartments. In the other compartments, the old rafters were in fair condition, but additional rafters were put in, making the rafters 1-in. centers; 1-in. sheeting was nailed on top, then elaterite roofing with seams horizontal, then 2x4-in. battens 3 ft. apart. Lag screws were used to hold 2x4-in. battens to the rafters, making a roof that will stand as long as the rafters are good, or until the elaterite roofing disintegrates. To prevent the 2x4-in. battens from cutting into the elaterite roofing, a washer of elaterite was used under all of them. The roof of these three compartments has been in use a trifle under two years, but has never leaked and is in good condition.

Exhausting Gases from Bag House

Each of the four compartments has a steel stack, 6 ft. in diameter by 78 ft. high, coming out from the apex of the roof, about the center of the compartment. When the stacks were built the joints were lapped so that some of the condensation finds its way to the outside of the stack, continually giving them an unsightly appearance. This also weakens the stacks, due to the corroding influence of the weak acid solution going through the joints. The four stacks are now corroded to a considerable extent and one or two holes can be observed at a distance of about 32 ft. from the top. About every two years the stacks have been painted on the outside.

To take care of the condensed moisture that trickles down the inside of the stacks, a lead-lined pan is hung under the stack at a sufficient distance so as not to interfere with the draft. From this lead-lined pan a lead gutter runs out onto the roof. At certain seasons considerable solution is caught in these pans. We had some sad experiences trying to use an iron elbow and iron pipes to lead this solution to the roof, as the iron pipe would eat through, and before we knew of the condition, several bags would be ruined by the weak acid falling on them. The lead gutter with a lead connection from the pan solved this difficulty and gives good satisfaction.

Compartments and Cellars

The baghouse is completely divided into four compartments by means of brick partitions running from the floor line to the apex of the roof. These partitions are the same thickness as the outside walls. Below the thimble floor, each compartment is divided into four chambers or cellars by means of 13-in. brick partitions. These cellars are 87x12 ft., each one having a 4x8-ft. iron door, through which the dust can be removed.

A 16x16-ft. distributing flue built of brick, jack arch roof construction, runs the entire length of the baghouse and connects with each of the 16 cellars by means of 42-in. bull's-eye valves, made of ¼-in. sheet steel stiffened by angle irons. These dampers are hinged at the top and open into the distributing flue. They are operated by means of 2-in. gas-pipe stems running through the distributing flue.

On top of this distributing flue is a smaller flue 11x16 ft. running the entire length of the baghouse and connected to each cellar by means of 34-in. bull's-eye valves. The dampers in these valves open into the cellars and were originally operated by means of gas-pipe stems running through the flue, but now, due to the stems corroding, the dampers are closed and opened by means of a chain on the thimble floor. This upper flue is connected to the baghouse fan flue by means of a 6-ft. sheet-iron downtake containing a butterfly damper, and is used to conduct the gases from any chambers that are in the sintering process, back to the fan and thence into the distributing flue.

The thimble floor, as has been previously stated, is divided into four compartments, each compartment containing 1008 steel thimbles 17 in. inside diam-

eter and 10 in. high. These thimbles are made of No. 14 steel plates and are riveted to the steel floor which is made of No. 10 steel plate.

Hanging and Shaking of Bags

The bags are 18 in. in diameter and 30 ft. long. The original 4032 cotton bags were wired at the top and suspended by this wire from hooks fastened to small 3-in. channel irons. To shake the bags it was necessary to air the compartment completely and then go in between two rows of bags, shaking the bags on each side by hand. In 1910 each row of bags was hung on a 1½-in. gas pipe which was suspended by a U-bolt from the old bag hooks. By means of a lever on the outside of the building, this gas pipe could readily be given a horizontal motion of about five inches, the pipe coming to a sudden stop by means of a collar striking an iron plate on the inside of the baghouse wall. In addition to the horizontal motion, about ½-in. vertical motion is given, which motion is also beneficial. Forty-two bags are shaken by means of one lever; this requires not more than three or four minutes. This shaking device has many advantages, I believe, over the system used at the Selby plant, where gas pipes are run on ball rollers. The ball runs and ball rollers have a tendency to accumulate moisture and fume, making it necessary to clean at intervals. The construction of ball runs and rollers is a more expensive construction than the U-bolt hangers; also there is no vertical motion.

When this shaking device was installed it was decided to have all bags folded over three inches and sewed across at the lower part of the fold. This allowed us to put a broom handle or any piece of round stick through the bag and hang up by means of this stick. The old method of gathering the top of the bag and fastening it with wires has a tendency to allow the dust to stick in the folds and in time to rot the bags at the top. With the stick running through the fold, the bags stay open in better shape and also there is no wire to come in contact with the fiber of bags.

Cotton Bags First Used

Originally 4032 cotton bags 18 in. in diameter by 30 ft. long were put into use July 7, 1907. These cotton bags cost $2.136 apiece, f.o.b. Murray, and were purchased from the Denver Dry Goods Co., Denver, Colo. At the end of two years it was computed that the average life of the cotton bags was 17 months, 11 days. Owing to no drip pans being provided under the four steel stacks many bags were lost in the first eight months, due to condensation of moisture in these stacks and the consequent dripping of this moisture (containing small traces of acid) on to the bags. In fact during the first eight months 588 bags were replaced. The leaky roof after about one year's run was also instrumental in destroying many bags.

No. 4 compartment was equipped with woolen bags purchased from the Buell Manufacturing Co., St. Joseph, Mo. These bags cost $4.7185 apiece f.o.b. Murray. The compartment was put into commission May 19, 1909, and to date there have been no bags replaced. About 12 bags have been lowered one foot during this time due to rotting near the bottom. The fiber of the bags is quite strong as yet, and I would estimate that the average life will be nearly four years. Shortly after these bags were put into commission about one-third of the roof on No. 4 was blown off, and a rain storm occurred at the same time, which drenched at least half of these woolen bags with no apparent ill effect. The woolen bags in this compartment are all hung by means of wire twisted around the tops of the bags.

At the present time we have no cotton bags in service, and are completely equipped with woolen bags with the exception of 273 thimbles that are not now in use, but will have woolen bags put on them shortly. These 273 thimbles were reserved to use up the old cotton bags, the last of which were rotted away last winter. I might add that 90 woolen bags were purchased from the La Porte Woolen Mills, La Porte, Ind., at an average cost of $4.784 f.o.b. Murray. These bags were installed about two years ago and appear to be of a good quality.

Filtering Area 3.45 Sq.ft. per Cubic Foot of Gas

There were 570,012 sq.ft. of surface provided for filtering 165,000 cu.ft. of gas per min. or at the rate of 3.45 sq.ft. of filtering surface per cubic foot of gas per minute. When one compartment was shut down for sintering, however, there would be 2.59 sq.ft. of filtering surface per cubic foot of gas per minute, and as it was expected that one compartment would be down most of the time, 2.5 sq.ft. was the basis used for calculating the number of bags needed.

A Buffalo Forge exhaust fan with impeller 6x15 ft. brings the gases from the blast furnaces and forces them into the distributing flue and through the bags. This fan is capable of handling 1500 cu.ft. of gas per revolution at pressure of 1-in. water. A 100-hp. motor, taking 60 i.hp., was formerly used when the fan was running at 93 r.p.m. and handling gases from eight blast furnaces. Later a 50-hp. motor was installed, as we had only 5 or 6 furnaces in blast. The indicated horsepower required when running at 80 r.p.m. with the 50-hp. motor is about 45. The countershaft is equipped with ring oil bearings and inner fan bearings are water jacketed. Little difficulty has been experienced with this fan since its installation. Pressure in the distributing flue is usually about ½ in. of water, at times going up to ¾ in. just before shaking the bags.

Conducting Gases from Furnaces

The blast-furnace gases are conducted through 795 ft. of brick flue and 70 ft. of sheet-iron gooseneck; 725 ft. of this brick flue is 16x17 ft., walls 17 in. thick, roof 8 in. jack arches, 5 ft. centers; 70 ft. of the brick flue is 16x20 ft., walls 17 in. thick, roof of reinforced concrete slabs 4 in. thick. The sheet-iron gooseneck is 20 ft. in diameter made of ¼-in. steel. Back of the blast furnaces is 262 ft. of 16x20 ft. flue with sloping bottom, so that No. 1 blast furnace is about 865 ft. from the baghouse fan, while No. 8 blast furnace is about 1127 ft. from the baghouse.

AVERAGE TEMPERATURE OF GASES ENTERING FAN

Month	1909 Deg. F.	1910 Deg. F.	1911 Deg. F.
Jan	81.4	83.3	79.9
Feb	73.0	93.0	79.9
Mar	83.9	113.4	83.47
Apr	91.3	107.2	93.4
May	102.0	106.3	108.65
June	115.5	124.2	114.5
July	117.1	131.0	123.9
Aug	115.3	130.9	120.5
Sept	99.46	110.7	114.3
Oct	105.68	93.7	93.9
Nov	103.02	89.15	90.7
Dec	94.6	87.0	81.9
Average	98.52	105.82	98.75

The temperature of the gases leaving the blast furnaces varies somewhat. Some readings showed 119° F. in the flue near No. 1 blast furnace and 85° F. at baghouse, showing a drop of 34° F. in the 865 ft. of flue when the outside atmosphere was 64° F. No tests have ever been made at this plant to find how much SO_3 and arsenic are thrown out in the flues due to the drop of temperature. The gases entering the baghouse were analyzed, however, at a time when there was a decided deterioration of the bags and were found to contain 0.003% SO_3.

Details of Baghouse Operation

The gases discharge from the fan into the distributing flue; the lower bull's-eye valves being open, the gases enter the 16 cellars, filter through the 4032 bags and discharge through the four steel stacks on top of baghouse. Once every 24 hours all the bags are shaken, the operator using the outside lever and shaking each row of 42 bags. All doors in compartments are kept closed while shaking bags, so as not to allow the temperature in the baghouse to go down too low. The shaking operation is done by first closing the four dampers in the lower valves of one compartment, shaking the bags, opening the valves again and taking the next compartment in turn until the bags in all four compartments have been shaken. This usually occupies the attention of one man for about three hours each day, but could be done much quicker if necessary.

On the first of each month, one cellar

door in each compartment is opened, dust measured and representative sample taken. This is done for the purpose of taking stock. The doors are then closed and sealed by means of mortar. When the dust has accumulated to a thickness of about 24 in., the entire compartment is closed off from the distributing flue, the cellar doors and valves connected with the return flue are opened and fume in the four cellars is lighted by means of hot coals. Formerly we set fire to the fumes across the front, allowing the changing an apparent gain of $6547 into an apparent loss of $58,746.

If the Murray plant had been equipped to recover arsenic from this fume, instead of having to ship it, it would have lost only $24,101. This shows that on the immediate financial outcome, a baghouse is not profitable in lead plants where the charge is low in lead. However, the elimination of lawsuits may make a baghouse a profitable installation.

An analysis of sintered Murray fume is: Au, 0.014 oz. p.t.; Ag, 2.4 oz. p.t.; Pb, 27.3%; Cu, 0.05; SiO_2, 2.5; Zn, 4.2; S, 4.2; As, 33.5; Fe, 5.2 per cent.

RECOVERY OF FUME, ETC., FOR ENTIRE OPERATION OF MURRAY PLANT BAGHOUSE, JULY 7, 1907, TO FEB. 29, 1912.

	Charge Smelted	Fume recovered	Assay Fume recovered	Per cent of Charge recovered in fume	Value of Metals recovered
Weight	1,666,857 tons	13,857,645 lb.		0.415%	
Gold	256,874.986 oz.	125.595 oz.	0.018 oz. p. ton	0.049	$2,587.10
Silver	24,725,274.19 oz.	14,885.62 oz.	2.15 oz. p. ton	0.063	8,028.25
Lead	354,693,161 lb.	4,492,288 lb.	32.4%	1.269	141,745.02
Copper	16,521,715 lb.	1,947 lb.		0.0118	330.15
Total					$152,690.52

Operating Expense	
Labor	$16,440.05
Motive power	13,542.10
Supplies and repairs	46,871.28
Total	$76,853 43

Profit Statement	
Treatment charge 6929 tons at $10.00	$69,290.00
Operating cost	76,853.43
Total cost	$146,143.43
Value of metals recovered	152,690.52
Gain for 4 years, 8 months	$6,547.09

SAVED IN OMAHA BAGHOUSE

Contents of 1551 tons fume.			
5559.44 oz. Ag @ 0.54		$ 3,002.00	
2,650,774 lb. Pb @ 4.30		113,983.00	
10,818 lb. Cu @ .08		865.00	$117,850.00
Direct Cost or Expenses			
Labor	$904.16		
Power	1985.29		
pplies and repairs	2953.05	5842.50	
Smelting 1551 fume @ $2	3102.00		
Refining 1325 tons lead @ $5	6625.00	9727.00	15,569.50
		Apparent Net Profit	$102,280.50
Less 6% interest on cost of Baghouse No. 1 (about $42,000		$2520.00	
2½% Amortization		1050.00	3,570.00
		Net profit	$98,711.50

burning gradually to creep to the back, but as this generally took from 10 to 14 days to complete the sintering process, we changed the method and now throw the hot coals all over the surface of the fume. This apparently gives a much better sinter and the operation is complete within five or six days, so that the fume can be removed. Spontaneous ignition was frequent the first two or three years we were operating the baghouse, but of late it is rare. The exact cause of this spontaneous ignition has never been definitely determined at this plant, but we have found that it generally occurs when over 24 in. of fume has accumulated.

One Man Operates Baghouse

Except when sintered fume is being removed from the cellars, one man on day shift operates the baghouse. For the other 16 hours, an oiler comes over every two hours, takes a temperature reading at the fan inlet and oils the bearings.

The laborers take a shower bath and change their clothes before leaving the bath house. When the baghouse was first started, rubber suits were furnished the bag shaker and foreman, but this was found unnecessary, and cleanliness is the only essential.

An accomanying table shows the apparent gain from the Murray baghouse in 4⅔ years. But the figures given do not include interest and amortization. Interest at 6% on the construction cost, $127,195 for 4⅔ years, would be $35,614, and 5% amortization would be $29,679,

OMAHA BAGHOUSE, FISCAL YEAR 1910

Material to Converters in Tons

	Matte	Iron	Coppery Lith'rge	Ore	Flux and Lining	Slag	Cleanings	Fume	Total
Basic	11,885	167	2,424	668	1,890	7,765	1,964	1,253	28,016
Acid	9,659	...	2,496	...	2,671	6,427	3,443	1,055	25,751
Total	21,544	167	4,920	668	4,561	14,192	5,407	2,308	53,767

Contents of Charge and Recovery in Tons

	In Matte and Litharge		In Returns		Total charge		Fume Produced*	Lead Recovery
	Lead	Copper	Lead	Copper	Lead	Copper		
Basic	4,639	5,766	3,233	595	7,602	6,361	1,849	1,115
Acid	4,309	4,176	3,003	649	7,312	4,822	1,629	974
Total	8,948	9,942	6,266	1,244	14,914	11,183	3,478	2,089

*Part returned to converter.

Omaha Converter Baghouse System

The gases from two stands of acid-lined converters and one Peirce-Smith are led into a 1250-ft. steel flue and thence to a baghouse. One set of bags filters about 1600 tons of lead-sulphate fume, representing 4500 tons of blister copper. Long life for the bags, apart from cooling the gases, seems to be attained by drawing the filtered gases away rapidly, so the baghouse is connected to a 300-ft. self-supporting steel stack, brick-lined. In winter a small reverberatory leads into the stack to warm it. Following are some of the data: Cubic feet of flue, 68,000; cellar, 67,000 cu.ft.; bag chamber, 174,000 cu.ft.; 940 bags, 28 ft. long; filtering area, 124,000 sq.ft.; production about 45 tons of blister copper per day from matte assaying: Cu, 45%; Pb, 23; S, 18 per cent. In February, 1911, there were 1667 tons of blister produced, 100 dry tons of fume were taken from the flue, 130 dry tons from the fan, and 385 dry tons from the baghouse. For each ton of blister, 0.221 tons of lead were saved. The cost of operating for seven years was $0.787 per ton of blister.

Omaha Blast-furnace Baghouse

Two baghouses serve the Omaha blast furnaces. In 2½ years there were 2623 tons of fume carrying 50% lead collected, the charge meanwhile carrying 31,254 tons of lead. This shows a saving of 4%. On an average of seven years, the cost of operating the baghouse per ton of lead treated was $0.847, the saving about 42c. per ton.

Burnt fume, carrying, say, 18 to 20% of arsenic and 2% of antimony, is fused in a small reverberatory, and the fumes led to a 300-ft. stack. About 5% of ar-

senic remains in the slag. The fused material is cooled and then charged alone into the residue furnace of the lead refinery, with a little reducing agent, if necessary, reducing a little lead to take out the silver. The slag from this operation carries about 5 to 6% Sb and 3 to 4% As. This is reduced in a blast furnace with lead skimmings. The metal carries about 10% Sb and 3% As, and is purified by a fire method from the latter.

In fusing the burnt baghouse fume, a Pb-Te speiss settles out on the bottom of the furnace, from which tellurium is recovered as a marketable product.

In the fiscal year 1910-1911, when there was only about half the customary amount of material treated in the blast furnaces, this baghouse still gave satisfactory results, as is shown by the accompanying table:

MATERIAL SMELTED, 1910–1911

	Tons
Copper byproducts	23,090
Ore	22,762
Lead refinery by products	13,710
Matte	2,672
Limestone	6,345
Burnt lime	39
Iron	1,391
	70,009
Blast furnace returns	4,103
Total	74,112

FUME COLLECTED

580 tons, 1615 oz. Ag. @ 54c		$872
460,000 lb. Pb. @ 4.30		19,780
		$20,652
Expenses		6,558
Smelting, 580 tons @ $2		1,160
Refining, 230 tons @ $5		1,150
		$8,868
Apparent profit		$11,784
Less interest @ 6%	$3600	
Less amortization @ 2½%	1500	4,100
Net profit		$7,684

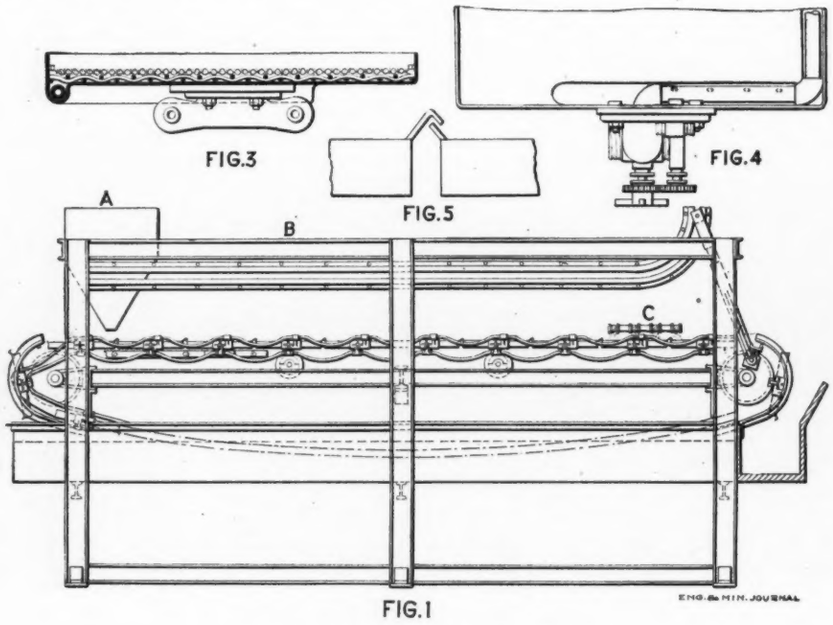
In discussing this paper, which was given in abstract without any figures, Doctor Heberlein said that the wet-condensation processes were in favor in Europe because of smaller cost and better sanitary conditions resulting. He said that there was no difficulty in effecting a scrubbing of the fume even at 70° C. by sprays or churning devices. The addition of lime helped, and the average recovery was 92%. Mr. Eilers said that his figures showed the baghouse to be less expensive both to construct and to operate, and there the matter rested.

Separation of Cadmium and Zinc

In the course of a paper by Eric John Ericson on spelter analysis, before the International Congress of Applied Chemistry, it was remarked that an easy separation of cadmium from zinc was given by the electrolysis of the mixed solution using a platinum electrode previously coated with cadmium. Under such conditions cadmium deposits even with as much as 10% of free H_2SO_4 present.

Traylor Slime Filter

Letters patent, No. 1,029,155, have been granted to Bruce W. Traylor, of New York, for a continuous slime filter. The machine is an improvement on that patented by the inventor, Apr. 19, 1910 (U. S. Pat. No. 556,430), and consists essentially of a series of narrow filtering pans flexibly connected and moving horizontally over two rollers fixed in a suitable framework. The series of pans move like a belt, each pan in succession receiving the pulp from the delivery hopper, as shown at *A*. The pans are connected with each other by two lines of hose, one reaching the compressed air supply and the other connecting with the source of vacuum. These connections are made with the pipes of each system by means of flexible hose connections, the movement of the system pipes being controlled as shown at *B* by the overhanging track.



DETAILS OF TRAYLOR SLIME FILTER

In order that the operation of the valves connecting the pans with the compressed air and vacuum sources may be operated automatically, the arrangement shown in Fig. 4 has been devised, in which both valves are set at the required point by the engagement of the lower star-wheel with a fixed pin.

An arrangement for spraying the cake with wash solution or water is placed near the end of the horizontal travel of the pans as shown at *C*. In Fig. 3 is shown a detail of the pan. After passing over the end roller, the pans are submerged in a water tank where, by the aid of a blast of air, they are thoroughly cleaned of adhering slime. In order to prevent spilling of the pulp during the filling operation a baffle shown in Fig. 5 is provided.

Increased Quartz Production

In 1911 the production of quartz in the United States was 86,823 short tons, according to a report by Jefferson Middleton, of the U. S. Geological Survey, an increase in quantity of 23,246 tons over 1910. The increase in quantity was entirely in the crude quartz, the ground material decreasing in both quantity and value. The production of quartz in 1911 was the largest in five years except for 1909, when it was 121,459 short tons.

The figures on quartz production issued by the U. S. Geological Survey deal only with massive crystalline quartz, with flint, and with quartzite that is used for other than building or paving purposes. These grades of quartz are used in the manufacture of pottery—when it should contain less than 0.5% of iron-bearing minerals—paints, and scouring soap and as wood filler. Considerable quantities of ground quartz are used in the manufacture of paint, in some cases as much as one-third of the total pigment consisting of this material. Quartz crushed and graded to various sizes is used in the manufacture of sandpaper, sand belts, as a scouring agent with sand-blast apparatus, etc. Blocks of massive quartz and quartzite are used in the chemical industry and as a flux in copper smelting. Ground quartz is also used in filters and in tooth powders and by dentists as a detergent.

The Allegemeine Electricitaets Gesellschaft of Berlin, has placed the Rathenau gold medal at the disposal of the American Museum of Safety for award annually for the best device or process for safeguarding life and limb or promoting health in the electrical industry.

Geology of Ocampo District, Mexico

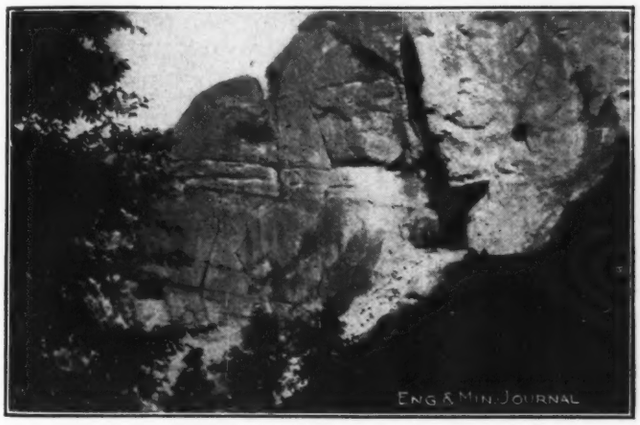
By Robert Linton*

The first discovery of ore in the Ocampo district was made less than a century ago. The ore occurs as shoots or lenses in lodes occupying fault planes in andesite, especially at the intersection of profound with minor faults. The valuable minerals in the ore are argentite and gold, the average grade being $12 per ton.

*General manager, Sierra Consolidated Mines Co., Ocampo, Chihuahua, Mex.

The old mining camp of Ocampo, or Jesús Maria as it was called until a few years ago, is in the extreme western part of the state of Chihuahua. It is 85 miles by mountain trail from Miñaca, the nearest railroad station, on the Chihuahua & Pacific R.R. A wagon road connects it with Temosachic on the Mexico Northwestern R.R., 107 miles distant.

Situated in the heart of the Sierra Madre mountains, the region is one of surpassing senic beauty. Broad mesas covered with splendid growths of pine lie to the east. The country immediately adjacent is an interminable series of deep, narrow cañons, unusually wooded and always rocky, through which flow crystal-clear mountain streams. The steepness of the country affords little chance for cultivation, but where any of the valleys widen sufficiently to permit it, the ground is cleared for ranching and good crops are raised—corn in the higher and oranges in the lower altitudes.



RHYOLITE TUFFS ON TEMOSACHIC ROAD

OUTCROP OF ORESHOOT IN MATULERA LODE

Ocampo is on the western slope of the continental divide and in the Mayo River drainage. Within short distances, however, are streams flowing into both the Fuerte and the Yaqui Rivers. The Cumbre de Jesús Maria, 8500 ft. elevation, lies immediately above the town to the northeast; Santa Brigida peak, over 9000 ft. elevation, lies to the northwest. Both these are prominent landmarks. To the south and west the country rapidly drops down to a much lower altitude, and a few hours' ride suffices to bring one into the region of semi-tropical vegetation. The altitude of the town of Ocampo is 5900 ft. above sea-level.

Ore Discovered Less Than a Century Ago

The principal mines occupy an area about five miles long by one or two miles wide. The camp is a comparatively modern one, the discovery having been less than 100 years ago. The largest producers have been the Santa Juliana, Refugio, Santa Eduviges, San José, Matulera and Belén. Records of the total production are not available, but it has been estimated by men who were familiar with the days of most active operation at not less than $100,000,000. The principal oreshoots have been stoped to depths varying from 700 to 1100 ft. below the outcrop. Until recently mining operations have been confined to the orebodies that outcrop on the surface, although it is probable that the formation contains others that show no outcrop. In connection with the reopening of the Ocampo mines by the Sierra Consolidated Mines Co., a comprehensive study of the geology of the district was made by F. H. Kay, of the U. S. Geological Survey, whose excellent work in this connection merits special acknowledgment.

The rocks of the district consist of massive andesite flows, with interbedded rhyolite and andesite tuffs, and with also occasional flows of rhyolite. The period of volcanic activity, of long duration, was post-Mesozoic, and resulted in building up a series of extrusives of great thickness. Following it came a period of gentle folding accompanied by minor faulting. Ocampo lies on the northeast limb of one of the broad anticlines resulting from this folding.

Somewhat later a period of instrusion followed, which, however, was not extensive, and is confined to the western portion of the district. Here are found several dikes and intrusive masses of a basic andesite-porphyry and two small dacite dikes. None of the intrusions have any economic importance.

Orebodies in Fault Zones

After these intrusions occurred the major faulting of the region. The general trend of the principal fault zones is in a northwest-southeast direction, or more or less parallel to the axis of the anticline. It is in these fault zones that the principal orebodies occur. Intersecting them are other faults striking usually northeast-southwest, but these appear to be earlier as they are found to be offset at points where the intersection can be clearly traced. The determination of the throw of the faults is impossible in nearly all cases, owing to the local nature of the flows and the difficulty in correlation. In two cases, where the throw can be observed with reasonable distinctness, it is found to be 300 to 500 ft. vertically. The northwest-southeast fault zones are quite wide and their formation was accompanied by extensive shearing and alteration. The altered zones are invariably impregnated with ferric oxide, giving to the whole a characteristic red appearance. This results in part from the alteration of the original iron in the andesite, but since in many cases it occurs in the altered rock through all the minute fractures, the bulk of it is probably of secondary origin. Alteration is by no means confined to the fault zones, although it is much more strongly pronounced along them where the rock is sometimes completely sere-

citized and its original texture entirely lost. Generally the degree of alteration is inversely proportional to the distance from the most pronounced plane of movement in the fault zone, becoming gradually less marked until it can only be detected by the microscope.

Andesite Most Abundantly Distributed

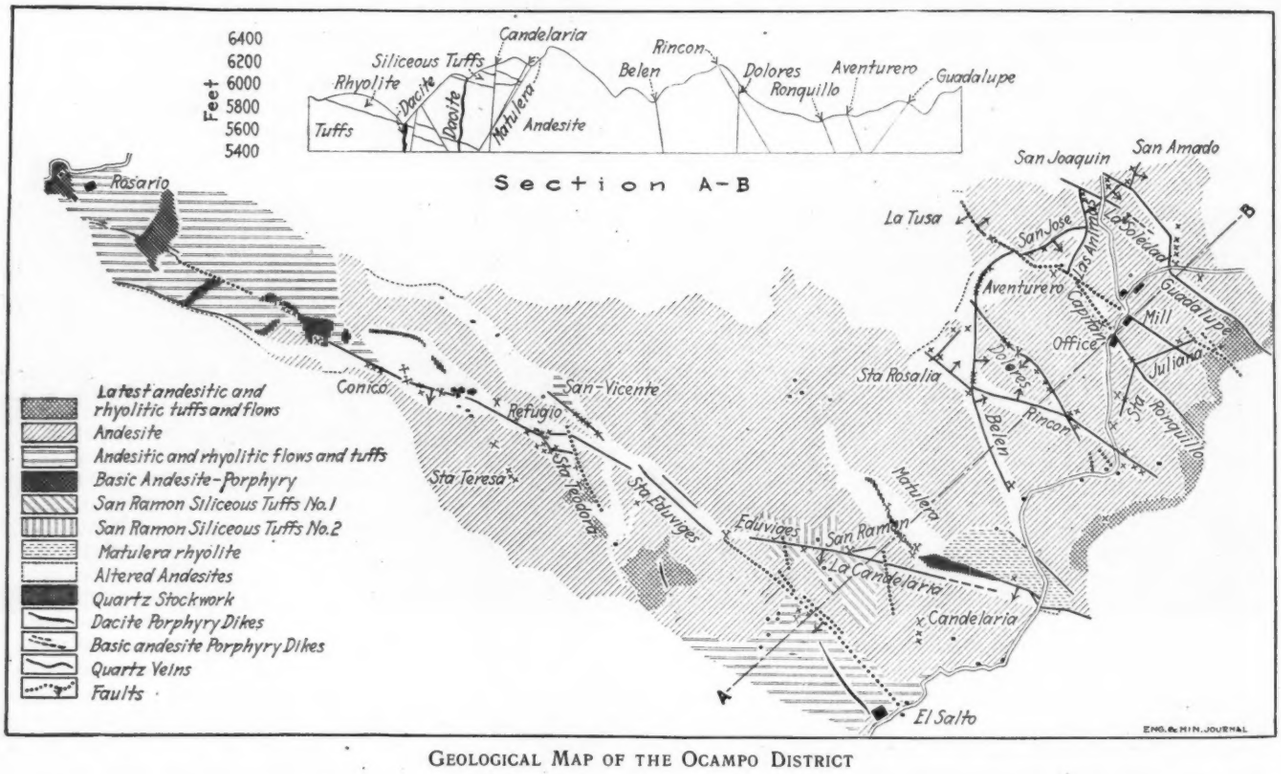
The andesite is by far the most abundant and characteristic rock of the region, covering fully nine-tenths of the mineralized area. The typical rock has a green or purple groundmass with numerous white plagioclase crystals, which render it distinctly porphyritic in appearance. The more massive variety has a fine-grained grayish-green groundmass with fewer and smaller phenocrysts. In many places the andesite has the appearance of a volcanic agglomerate or bréccia, in which inclusions of red or reddish-purple rock are inclosed in a greenish groundmass, or *vice versa*. The phases of this variety of andesite are numerous and varied, the inclusions ranging in size from microscopic particles up to three feet or more in diameter, and the dividing line between the inclusion and groundmass ranging from sharply-marked to a gradual shading out from the one to the other. Part of these occurrences are true volcanic agglomerates, in which the extrusive magma flowing over the surface absorbed fragments of rock resulting from the breaking down of previous flows of exactly the same character and composition.

Two distinct andesite flows are exposed, separated from each other by tuffs and rhyolite flows, which together have a thickness of nearly 600 ft. Overlying the upper andesite is the principal series of tuffs—both andesitic and rhyolitic—which form the bold outcrops capping the highest hills and constitute a prominent topographical feature of the district. The tuffs are usually massive, but occasionally exhibit a high degree of stratification, the dip being uniformly to the northeast.

The rhyolite variety, easily distinguished by its light color, predominates, but in many places, especially near the bottom of the series, a purple andesitic phase, usually mixed with fragments of the underlying flow, is rather prominent. The tuffs were laid down before the period of faulting, as the faults and shear zones can be traced upwards through them wherever they have not been eroded off.

Ore Occurs as Shoots or Lenses

The ore deposits occur as shoots or lenses lying along some well pronounced plane of faulting in the wider shear zones, or in the smaller fault fissures. It is only in the latter that the deposits approximate a true vein formation. In the fault zones, which are well defined and traceable for considerable distances, the extensive shearing and subsequent infiltration of mineralizing solutions has produced an andesitic breccia, in which the crushed country rock has been recemented by quartz, and in which, at favorable places, there has been concentration of the gold and silver in sufficient degree to bring about the occurrence of pay shoots. Owing to the irregular distribution of the quartz deposits over the altered area, and the fact that the shear zones usually comprise several distinct fault planes more or less parallel, the ore-bearing formations are more properly termed lodes than veins, the lodes including not only the quartz and ore deposits, but also the more or less silicified altered eruptive which lies along the faults and which is directly related to the ore occurrence. The lodes are sometimes brought into relief by erosion, when the formation is highly silicified and thus rendered harder than the surrounding country rock. Such prominent quartz veins are found along the outcrops of some of the important oreshoots, but not along all of them, and as a matter of fact the lodes are marked throughout the greater part of their length more by the contrasting colors of altered and unaltered material than by topographic relief occasioned by outcropping lodes.



Geological Map of the Ocampo District

Quartz Occurs in All Formations

While andesite is the country rock surrounding most of the orebodies, there is no indication of any selective action on the part of the mineralizing solutions that would make the andesite the favorable horizon for ore deposition. The tuffs have been eroded over the greater portion of the area leaving the lodes outcropping in the underlying flows. As quartz outcrops are traceable at several points to the highest tuffs, and as orebodies have been found likewise in the tuffs in other mines in the vicinity, it may be concluded that

quartz deposition has occurred in all formations without partiality. The evidence seems to show that the ores came from a deep-seated source and were deposited from ascending waters in the fissures and along the fault planes that afforded them channels of circulation.

The oreshoots are rather irregular in size, shape and grade. The long dimension is always in the plane of the lode, and usually conforming more to the dip than to the strike. There is always one well defined wall along which the ore lies, and occasionally two, although this is less common in the wide shear zones than in the smaller and simpler fault fissures. The most favorable locality is the intersection or junction of a minor fault or fracture with one of the more profound faults. Practically all of the large oreshoots that have been profitably worked lie along such intersection or junction points.

The three principal lodes are the Santa Eduviges, Matulera and Belén. The first mentioned is clearly traceable for over two miles and includes two of the largest mines of the district—the Santa Eduviges and Refugio. The Matulera lode is shorter, extending for a length of three-quarters of a mile and including the mine of the same name. The Belén lode is traceable for about two miles and includes the Belén, San José, Balvanera and San Amado mines. The best instance of an ore deposit in a simple fault fissure with little alteration of the andesite is the Santa Juliana at the extreme eastern end of the camp.

The shoots that have furnished the production of the larger mines have ranged from 300 to 700 ft. in length, from two to 20 ft. in width and extending to a depth as yet undetermined. The Santa Juliana mine was stoped down to a depth of 1100 ft., and recent development work in the Matulera mine has opened the shoot on the 1500-ft. level, with no tendency, it may be added, towards a lower grade of ore.

Ore Composed of Argentite and Gangue

Mineralogically the ore is practically all argentite. Occasionally small amounts of more complex ores are found, but these occurrences are rare. Associated with the silver there is always some gold; the proportion by weight of silver to gold averaging about 60: 1. Pyrite occurs in abundance throughout all of the lodes, but only rarely is it associated with silver or gold. This pyrite, called by the natives *bronce* probably resulted from the alteration of the iron of the andesites. There is also a gold- and silver-bearing pyrite —called *pasta*—of occasional occurrence, associated with the silver sulphides in the oreshoots. This pyrite is probably of secondary origin. It is usually fairly rich. Near the surface, where the ore is largely oxidized, there is a certain amount of free gold, and in the richer portions of the shoots native silver is not of infrequent occurrence. Naturally in a formation of this character the grade of the ore varies within rather wide limits. The average gross value of the ore at present developed is $12 per ton, while in the enriched portions of the shoots the grade rises to above $500 gross per ton.

Motor Truck for Mine Transportation Service

The Arizona Southwest Copper Co. of Yucca, Ariz., has in use a 6½-ton Saurer motor truck to haul its concentrates from Copperville to the Santa Fé R.R. station at Yucca, a distance of 27 miles. The first 15 miles from Yucca is a continuous upgrade of from 2 to 4% over desert roads which have a number of deep sand washes. The next seven miles is a steep climb up the Wallapai Mountains. It takes the truck 2½ hr. to make this distance. The last five miles is a downgrade of from 6 to 8% to the mine.

The road surface is fairly good and the Goodrich tires with which the truck is equipped show little wear after running

Saurer Truck Transporting Mill Equipment

3000 miles. The first two months the truck was in operation it was used to haul mill machinery and supplies to the mine. With lumber and supplies the round trip was easily made in one day but the delay incident to loading heavy machinery brought the average time per round trip up to 1½ days for the first month.

The following costs, furnished by the International Motor Co. of New York, which is handling the Saurer trucks, has been taken as an average of the round trip for the first month.

Gasoline, 19 gal @ 30c	$5.70
Oil, 5 qts. @ 20c	1.00
Grease, 1 lb. @ 12c	0.12
Driver, 1½ days @ $4.00	6.00
Total visible expense	$12.82

The upkeep expense is given at the following figures:

Interest on investment @ 6% and insurance for 1½ days	$2.11
Depreciation @ 10%	2.67
Repairs	2.25
Tires	2.83
Total upkeep expense	$9.86

The total cost per round trip, hauling five tons one way is $22.68; cost per ton $4.54. The former cost per ton, hauling with teams, by contract was $15, a saving of $10.46 per ton. The saving on each trip of the motor as compared with former hauling costs is $52.30. To make the round trip with horses it took on the average four days. When the mill is in operation and the truck is used for hauling concentrates the above conditions as to grade will be reversed as there will be only five miles upgrade against the load and practically 22 miles downgrade to the railroad.

Electric Furnace Desulphurization

The chemical action that takes place in an electric furnace during the refining of steel results in the dephosphorization and desulphurization of the bath according to the statement made by Cecil Myers in a paper read before the Manchester (Eng.) Association of Engineers. The action takes place in two stages. In the first, which is the oxidation period, the carbon, silicon and manganese are oxidized and in the second, which is the deoxidation period, the metal is dead-melted, and the sulphur is eliminated. The first action is brought about by adding to the charge, certain quantities of lime and oxide of iron, which, under the influence of the high temperature, oxidize the carbon, silicon and manganese, and remove the phosphorus as calcium phosphate. After this operation, the slag is removed from the bath, and further quantities of lime and sometimes carbon, are added. This is the second stage, when the sulphur passes into the slag as calcium sulphide, which is not soluble in the bath.

In the openhearth furnace, calcium sulphide would be readily oxidized into calcium sulphate which would combine with the iron to form sulphide of iron, carrying the sulphur back into the steel. In the reducing atmosphere of the electric furnace this change cannot take place, so that it is possible to remove the sulphur to almost any extent.

In reply to a question as to whether good steel castings could be produced by the electric furnace, Mr. Myers stated that they certainly could, but they would be more expensive at present than the product of the openhearth furnace, and probably not much better.

The power possibilities of the Green River, the main branch of the Colorado, have been little developed. The U. S. Geological Survey estimates that 1,500,000 hp. could be developed in the basin of the Green River, which has a fall of 11 ft. to the mile for a distance of 25 miles, and a total fall of 3875 ft. in 425 miles.

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20,149—CHILE—The Chanarcillo Mining District, (Chile). Casar Zelaya. (Mex. Min. Journ., July, 1912; 1 p.) 20c.

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20,151 — CONCRETE — Some Applications of Concrete Underground. H. T. Mercer. (Lake Superior Min. Inst., Aug., 1912; 16 pp., illus.)

20,152—CONCRETE SHAFT LINING. E. R. Jones. (Mines and Minerals, Sept., 1912; 1¾ pp.) Materials and properties used in making reinforced concrete sets. Tests showing relative strength of concrete timber. 40c.

20,153—COST of the Santa Ramona Shaft. B. R. Bates. (Min. and Sci. Press, Aug. 10, 1912; ½ p.) 20c.

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20,155 — CRUSHING — Edison Giant Crushing Rolls. J. F. Springer. (Min. and Sci. Press, Aug. 31, 1912; 1½ pp.) Describes plant of National Limestone Co. at Martinsburg, W.Va. 20c.

20,156 — EXPLOSIVES — Magazine for Storing and Thawing Dynamite. Claude T. Rice. (Eng. and Min. Journ., Aug. 31, 1912; 1¼ pp., illus.) 20c.

20,157—EXPLOSIVES—Magazines and Thaw Houses for Explosives. Clarence Hall and Spencer P. Howell. (U. S. Bureau of Mines, Tech. Paper 18, 1912; 34 pp., illus.)

20,158—EXPLOSIVES—Recherches de la Station d'Essais de Lievin sur les Explosifs de Surete pour Mines Grisouteuses et Poussiereuses. J. Taffanel and H. Dautriche. (Eighth International Congress of Applied Chemistry, Sept., 1912; 19 pp.)

20,159 — HAULAGE — Storage Battery Haulage at the Big Fire Tunnel, Idaho Springs, Colo. H. B. Barnes. (Min. Sci., Aug. 15, 1912; 2¾ pp., illus.) 20c.

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20,166—MINE SANITATION. E. B. Wilson. (Lake Superior Min. Inst., Aug., 1912; 10 pp., illus.)

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20,168—ORE BINS—Ein in Eisenbeton ausgefuehrter Erz- und Kalksteinsilo. E. Elwitz. (Stahl. u. Eisen, Aug. 15, 1912; 3¾ pp., illus.) A series of ore and limestone bins constructed of ferro-concrete. 40c.

20,169 — ORE TRANSPORTATION — Conveying Ore to Vessels on Inaccessible Coasts. C. A. Tupper. (Min. and Eng. Wld., July 20, 1912; 4 pp., illus.) 20c.

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20,171—RESCUE APPARATUS—Verbesserungen an Regenerationsapparaten mit gasfoermigen Sauerstoff. Gustav Ryba. (Oest. Zeit. f. B. u. H., Aug. 3, 10, 17 and 24, 1912.) Improvements on regenerating apparatus with gaseous oxygen; to be continued. $1.40.

20,172—RUSSIA—Zur Kenntniss der gegenwartigen Lage der Berg- und Huettenindustrie in Russland. Grossmann. (B. u. H. Rundschau, July 20, 1912; 2 pp.) Present condition of the mining and metallurgical industry in Russia. 40c.

20,173—SHAFT SINKING—Le Procede Stockfisch pour le Creusement des Puits et son Application au Siege II de la Gewerkschaft Diergardt. Krecke. (Ann. des Mines de Belgigue, Vol. XVII, Part 3, 1912; 16 pp., illus.)

20,174 — SHAFT TIMBERING — Steel Sets in Inclined Shafts. Walter Lyman Brown. (Min. and Sci. Press, Sept. 7, 1912; 4¼ pp., illus.) 20c.

20,175—SOUTH DAKOTA—The First Half of Year 1912 in South Dakota. Jesse Simmons. (Min. and Eng. Wld., Aug. 3, 1912; 3 pp.) 20c.

20,176 — STOPE MEASURING — "Simplex" Stope Measuring Instrument. O. Tonnesen. (Journ. Chem., Met. and Min. Soc. of South Africa, July, 1912; 2½ pp., illus.) 60c.

20,177—SURVEYING—Setting Out Underground Work. H. G. Henderson. (Eng. and Min. Journ., Sept. 7, 1912; ¾ p., illus.) 20c.

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20,189—ALLOYS—La Methode thermique et la Methode micrographique Appliquees a l'Etude des Alliages. E. Rengade. (Pub. de la Societe de Chimie-Physique, 1912; 13 pp., illus.)

20,190 — ALLOYS — Relations entre la Structure des Alliages et Leurs Proprietes Electriques. W. Broniewski. (Pub. de la Societe de Chimie-Physique, III, 1912; 12 pp., illus.)

20,191 — CONSERVATION — Notes on Mineral Wastes. Charles L. Parsons. (U. S. Bureau of Mines, Bull. 47, 1912; 44 pp.) Treats of wastes in the treatment and uses of the various metals and mineral substances.

20,192—GAS—The Use of Gas for Heat and Power; the Testing of Gas. Edward B. Rosa. (Journ. Frank. Inst., Aug., 1912; 28 pp., illus.) 60c.

20,193—ITALY—Etat Actuel de la Siderurgie en Italie. H. Ponthiere. (Ann. des Mines de Belgique, Vol. XVII, Part 3, 1912; 11 pp.)

20,194—METALLOGRAPHY—Das System Nickel-Kobalt. Rudolf Ruer and Kiosuke Kaneko. (Metallurgie, July 8, 1912; 2¼ pp., illus.) The system nickel-cobalt. 40c.

20,194 — PYROMETRY—Determination of Very High Temperatures. G. A. Shook. (Met. and Chem. Eng., Aug., 1912; 3¼ pp.) 40c.

20,195—PYROMETRY — Radiation Pyrometry—V. G. A. Shook. (Met. and Chem. Eng., Sept., 1912; 1 p., illus.) 40c.

20,196 — ROASTING — The Decomposition of Metallic Sulphates at Elevated Temperatures in a Current of Dry Air. H. O. Hofman and W. Wanjukow. (Bull. A. I. M. E., Sept., 1912; 55 pp., illus.)

20,197 — SINTERING — The Dwight & Lloyd Process of Roasting and Sintering. Arthur S. Dwight. (Eighth International Congress of Applied Chemistry, Sept., 1912; 10 pp.)

20,198—SLAGS—Alumina in Slags. H. C. Bellinger. (Min. and Sci. Press, July 27, 1912; 1½ pp.) 20c.

20,199—SMELTERY—The Mason Valley Copper Smeltery. Thomas T. Read. (Min. and Sci. Press, Aug. 31, 1912; 3¾ pp., illus.) 20c.

20,200 — SMOKESTACK — Raising a Stack at the Karabash Smeltery (Russia) while in Operation. Thomas J. Jones. (Eng. and Min. Journ., Sept. 14, 1912; ¾ p., illus.) 20c.

MINING AND METALLURGICAL MACHINERY

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20,202—AERIAL TRAMWAYS at Bingham Canyon, Utah. William Hewitt. (Min. and Eng. Wld., Sept. 7, 1912; 4 pp., illus.) 20c.

20,203—COMPRESSOR PLANT—Kompressoranlage auf der Zeche Unser Fritz. (Bergbau, Aug. 8, 1912; 2 pp., illus.) Compressor plant at Unser Fritz colliery, Wanne, Westphalia. 40c.

20,204—CONKER PLATE DETAILS. Percy E. Barbour. (Eng. and Min. Journ., Sept. 21, 1912; ½ p., illus.) 20c.

20,205—ELECTRIC FURNACE—An Efficient Electric Furnace for High Temperatures. D. F. Calhane and E. E. Bard. (Met. and Chem. Eng., Aug., 1912; 1¾ pp., illus.) 40c.

20,206—ELECTRIC MACHINERY—Determination of Power Efficiency of Rotating Electric Machines. E. Olin. (Proc. A. I. E. E., July, 1912; 24 pp.)

20,207—ELECTRIC MACHINERY—Direct-Current Machines; Installation and Operation. George E. Edwards. (Min. and Eng. Wld., July 27, 1912; 3 pp., illus.) 20c.

20,208—ELECTRIC MOTORS for Mines—British Practice. (Coal Age, Aug. 31, 1912; 4¼ pp., illus.) 20c.

20,209—ELECTRIC POWER — Production et Distribution de l'Energie electrique aux Mines de Lens. H. Besson. (Bull. Soc. de l'Ind. Minerale, Aug., 1912; 79 pp., illus.)

20,210—ELECTRIC POWER PLANTS—Elektrische Kraftanlagen auf Berg- und Huettenwerken in Rheinland-Westfalen, Belgien, Nord-Frankreich und England. Hoefer. (Zeit. des Vereines Deutsch. Ing., Aug. 10, 1912; 10 pp., illus.) Electric power plants at mine and metallurgical works in Rhineland-Westphalia, Belgium, the North of France and England.

20,211—ELECTRICAL EQUIPMENT of the Calumet & Hecla Mining Co., Calumet, Mich. John Liston. (Gen. Elec. Rev., Aug., 1912; 8 pp., illus.) 40c.

20,212—ELECTRICAL PLANT of the Golden Horse-Shoe Estates Co., Ltd. A. C. McGlew. (Journ., Chamber of Mines of Western Aust., Apr. and May, 1912; 15½ pp., illus.) $1.20.

20,213 — EXCAVATION — American Earthwork Machinery. Nos. I. and II. (Engineer, Aug. 9 and 16, 1912; 6 pp., illus.) First article of series describes various types of scrapers; second deals with the elevating grader. 80c.

20,214 — EXCAVATORS — American Earthwork Machinery. No. III. Drag-Line Bucket Excavators. (Engineer, Aug. 23, 1912; 2¾ pp., illus.) 40c.

20,215—GAS-ENGINE POWER for Mining and Metal Industries. Stuart Rice. (Min. and Eng. Wld., Sept. 7, 1912; 4 pp., illus.) 20c.

20,216—GASOLINE MOTORS in Mines, with special reference to their advantages and disadvantages for mine haulage work. A. F. King. (Mines and Minerals, Sept. 1912; 3 pp., illus.) 40c.

20,217—HOIST—The Franklin Air-Balanced Hoist. R. H. Corbett. (Eng. and Min. Journ., Sept. 21, 1912; 1¼ pp., illus.). Paper before the Lake Superior Min. Inst., Aug., 1912. 20c.

20,218—HOISTING — Power Consumption of Hoisting Plants. S. W. Sykes. (Mines and Minerals, Aug. and Sept., 1912; 4 pp.) Relative economies of steam, air and electric hoists; tests of electric hoists under varying conditions. 60c.

20,219—HOISTING ENGINE—Description of an Air Balanced Hoisting Engine—Franklin Mining Co. R. H. Corbett. (Lake Superior Min. Inst., Aug., 1912; 5 pp., illus.)

20,220—HOISTING ENGINES—Application of Electrical Hoisting Engines at a Limestone Crushing Plant. J. F. Springer. (Iron Tr. Rev., Aug. 29, 1912; 3 pp., illus.) 20c.

20,221—HYDROELECTRIC POWER—Developments of the Great Falls Power Co., Montana. (Elec. Wld., July 6, 1912; 5¾ pp., illus.) 20c.

20,222—LOCOMOTIVE—Steam Fireless Locomotive. Frank C. Perkins. (Coal Age, Aug. 24, 1912; 1 p., illus.) 20c.

20,223 — ORE UNLOADING — A New Ore-Unloading Plant at Cleveland. (Iron Tr. Rev., Aug. 29, 1912; 1½ pp., illus.) 20c.

20,224 — PUMP — Der Hydropulsor. Ernst Preger. (Glueckauf, July 13, 1912; 5 pp., illus.) The hydropulsator, an improvement on the hydraulic ram. 40c.

20,225 — SHOVELING MACHINE for Loading and Handling Loose Material. (Eng. News, Sept. 5, 1912; 1 p., illus.) 20c.

20,226 — TELEPHONES — The Use of Telephones in Mines. Gregory Brown. (Coal Age, Aug. 10, 1912; 1 p., illus.) 20c.

20,227 —TURBO-BLOWERS—Construction and Operation of Turbo-Blowers and Compressors. Franz zur Nedden. (Eng. Mag., Sept., 1912; 7¼ pp., illus.) Third article of series dealing with the design of impellers. 40c.

20,228—WATERWHEEL—The Pelton Waterwheel. (Mines and Minerals, Sept., 1912; 1¼ pp., illus.) Principles of construction of the impulse waterwheel; methods of calculating the power and speed. 40c.

20,229—WIRE ROPES for Lifting Appliances, and Some Conditions that Affect Their Durability. Daniel Adamson. (Iron and Coal Tr. Rev., Aug. 2, 1912; 1¾ pp., illus.,) 40c.

SAMPLING AND ASSAYING

20,230—ANTIMONY—Ueber ein Quarzglasquecksilberthermometer nach Dr. H. Beckmann zur Bestimmung geringer Antimongehalte in Blei-Antimonlegierungen. K. Friedrich. (Metallurgie, July 22, 1912; 3 pp., illus.) On a quartz-glass mercury thermometer devised by Dr. Beckmann for the determination of small amounts of antimony in lead-antimony alloys. 40c.

20,231 — ELECTROLYTIC ANALYSIS with Platinum Electrodes of Light Weight. F. A. Gooch and W. L. Burdick. (Am. Journ., Sci., Aug., 1912; 6 pp., illus.) 40c.

20,232—FLUE-GAS ANALYSIS for Beginners. J. E. Terman. (Power, Sept. 3, 10 and 17, 1912; 8 pp., illus.) 60c.

20,233—FURNACES—Spirally Heated Laboratory Furnace. (Eng. and Min. Journ., Sept. 21, 1912; 1¼ pp., illus.) Translated from Bull. de la Soc. d'Encouragement pour l'Industrie Nationale. 20c.

20,234—MARKING PORCELAIN AND SILICA CRUCIBLES, ETC. P. A. Young. (Journ. Ind. and Eng. Chem., Aug., 1912; 1 p.) 60c.

20,235—MINE SAMPLING—The System of Mine Sampling Used by Detroit Copper Co. E. F. Pelton. (Eng. and Min. Journ., Aug. 31, 1912; 1¼ pp.) 20c.

20,236—PREPARATION OF MINE SAMPLES for Assay. W. B. Blyth. (Journ. Chamber of Mines of Western Australia, July 31, 1912; 5¼ pp.) $1.

20,237—RAPID METHODS of Technical Analysis. (Colo. School of Mines Mag., Sept., 1912; 1 p.) Continuation of article previously indexed.

20,238—WATER SUPPLY for Laboratory Purposes. W. J. Hulings. (Eng. and Min. Journ., Sept. 14, 1912; ¾ p., illus.) 20c.

INDUSTRIAL CHEMISTRY

20,239—SULPHATE OF AMMONIA—The Production of Sulphate of Ammonia in the Year 1911.(Am. Fert., Aug. 24, 1912; 6¾ pp.) 20c.

20,240—WATER PURIFICATION—The Art of Water Purification. C. Herschel Kovl. (Journ. Assn. of Eng. Socs., Aug., 1912; 8 pp.) 40c.

MATERIALS OF CONSTRUCTION

20,241—BUILDINGS—Comparative Cost of Buildings of Wood, Concrete, and Steel Framing. Henry Grattan Tyrrell. (Eng. Mag., June, 1912; 20¼ pp., illus.) 40c.

20,242—CEMENT PLANT—Power Supply and Machinery Equipment of a New Portland Cement Plant. (Concrete-Cement Age, July, 1912; 2 pp., illus.) 20c.

20,243—CONCRETE SANDS—A Proposed Study of Concrete Sands. (Eng. News, May 30, 1912; 4¼ pp.) Communication from J. R. Freeman on defective concrete sands, which is answered by E. E. Free and R. H. Gaines. 20c.

20,244—GRANACITE—Granacit. Fischer. (Zeit. f. Angew. Chem., June 28, 1912, 1¼ pp.) Granacite, a variety of granite from deep deposits in Saxony which is more resistive to acids, etc., and therefore valuable for technical purposes. 40c.

20,245—PAINTS for Metallic Structures. Allerton S. Cushman. (Proc. Int'l Assn. for Testing Materials, June 28, 1912; 15 pp.)

20,247 — PORTLAND CEMENT — The Metamorphism of Portland Cement. Albert B. Pacini. (Concrete-Cement Age, July, 1912; 3¾ pp.) An analysis of the changes in portland cement and conditions effecting changes. 20c.

20,248—PORTLAND CEMENT CO. in Utah. (Salt Lake Min. Rev., July 30, 1912; 3 pp., illus.) 20c.

PERSONALS

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Frank Nicholson, of Joplin, Mo., has been visiting New York.

J. V. N. Dorr recently visited the Porcupine district, in Ontario.

C. Colcock Jones has returned to Los Angeles, Calif., from Nevada.

Frank H. Probert is in the Patagonia district, Arizona, engaged in professional work.

Frederick G. Clapp, of Pittsburgh, is examining reported gas discoveries in the province of Quebec.

H. C. Miller recently examined several gold properties in northern California for Eastern parties.

E. M. Hamilton is at the Nipissing mines, Cobalt, Ont., and expects to remain there until the end of the year.

R. B. Watson, general manager of the Nipissing Mines Co., arrived in New York Sept. 27, from a month's stay at Carlsbad, Germany.

T. M. Lowry has just returned from Northern Nigeria, where he was engaged for 14 months as acting inspector of mines, and is now in London.

P. Jansen, of Benkoelen, Sumatra, is visiting the Cobalt and Porcupine mining districts, in Ontario, to investigate the processes adopted for the treatment of ores.

C. E. Grunsky, Jr., of the American Engineering Corporation, San Francisco, has been appointed superintendent of the Standard Consolidated Mining Co. at Bodie, California.

F. F. Grout and E. K. Soper have returned to Minneapolis after a summer spent in the field investigating the clays of Minnesota for the Minnesota State Geological Survey.

F. Julius Fohs, of Lexington, Ky., has completed investigations of the Ohio and Allen County, Ky., oil and gas fields for Lexington parties, who will at once develop properties in these fields.

C. Ellison McQuigg has left the Boston & Montana Smelting Co., of the Anaconda Copper Mining Co., at Great Falls, Mont., to take charge of the Department of Metallurgy at the Pennsylvania State College.

A. D. Miles, formerly in charge of the Toronto office of the Canadian Mining & Exploration Co., Ltd., has gone to Copper Cliff, Ont., as assistant to President A. P. Turner, of the Canadian Copper Company.

Walter Harvey Weed has been examining the Kamloops property of the British Columbia Copper Co., and has gone to Cananea, Sonora, Mexico, to spend a few weeks looking over the Calumet-Sonora mine, of which he is consulting engineer.

G. C. Bateman, formerly at the Dome mine, in Porcupine, has been given charge of the Canadian Mining & Exploration Co.'s Toronto office in the Traders' Bank Building. Mr. Bateman was in New York early this week, leaving later for Vancouver.

Ocha Potter, who, as superintendent of the Superior mine, introduced and developed the use of the "one-man drill" in the Lake Superior copper district, has been appointed chief of the efficiency engineering department of the Calumet & Hecla and its associated properties.

Bergrath Dr. Vogelsang, general manager of mines and works of the Mansfeld Copper Co., at Eisleben, Germany, and R. Franke, director of the company, were in New York last week. They left Sept. 9 for Butte, Mont., and expect to spend October and November in visiting various copper mines in the West.

OBITUARY

Joseph H. Gorman died at Pottsville, Penn., Sept. 26. He was a grandson of one of the first operators in the anthracite region, and had himself operated for a number of years the Bell Colliery at Tuscarora, and an iron mine in Lehigh County.

Edward Leonard Dwyer was found dead at Janesville, Wis., Sept. 25. It is uncertain whether he was killed or committed suicide. He was 60 years old and had led a varied and adventurous life. At one time he was known as a mining promoter in Mexico and Colorado.

George Williams died in New York, Sept. 25, aged 72 years. He was for a number of years president of the Dutchess Mining Co., which owned and operated iron mines at Ancram, Copake, Halstead and Leedville in Dutchess County, N. Y. He retired from active business several years ago.

Henry Colt Mortimer, of New York, died at his summer home at Barnstable, Mass., Sept. 30, aged 62 years. He was head of the firm of Mortimer & Wisner, more recently Mortimer & Co., and was one of the oldest and best known dealers in heavy chemicals in New York. He was a director in several phosphate and chemical companies and a member of several clubs.

John G. Jennings died at Pittsburgh, Sept. 26, aged 48 years. He was born at Brady's Bend, Penn., his father being a prominent operator in the early days of the Pennsylvania oil field. He entered the oil business when a young man and became a large operator in Pennsylvania and later in the West Virginia field. He was manager of the Producers' & Refiners' Oil Co., president of the Jennings, the Delmar, the Kanawha and other oil companies.

Societies and Technical Schools

National Mine Rescue and First Aid Conference—This conference was to be held at the Bureau of Mines building in Pittsburgh, Sept. 23-26. A general discussion of the subjects indicated was expected, with reference of special topics to committees for consideration and report. A large number of engineers and representatives of mining companies were in attendance.

University of Pittsburgh—The mining school will open a four-year course in petroleum engineering at the opening of the college year, Sept. 30. During the first two years the curriculum will be the same as that of the mining engineer course. The last two years train the students in surveying, geological examinations, location of wells, laying out of power, pipe lines and pumping plants, and passing on the values of oil and gas properties. Roswell H. Johnson, who has been a consulting geologist in Oklahoma for the past four years, will be in charge of the geological instruction in this branch.

California State Miners' Association—The Executive Committee of the California Miners' Association has called a Convention to be held in the City of San Francisco, California, Dec. 9. The governors of the mining states will be requested to appoint delegates. The object of holding a convention of this magnitude is for the purpose of awakening interest in the mineral exhibit that is to be made at the Panama-Pacific International Exposition, which is to be held in San Francisco in 1915, so that the industry will be properly represented. There will be more or less expense incurred in carrying out this plan, and voluntary contributions to defray those expenses are asked. The office of the executive committee is in the Royal Insurance Building, San Francisco.

Colorado School of Mines—At this school, at Golden, Colo., the metallurgical ore dressing and experimental plant is now equipped with the concentrating unit and as the second quarter of the appropriation, amounting to $12,500, will be available on Oct. 1 the complete equipment for all the units is promised before the end of the year. C. E. Durrell has been making extensive tests with flotation on Colorado zinc ores and apparatus for the work has been arranged in the plant in advance of the completion of the permanent equipment. Last year a course in coal mining was added. As a result about 25 men are now attending the coal mining classes. One of the first coal mines opened in the state is within one-fourth of a mile of the campus, while the Northern Colorado lignite fields, the Cañon City domestic coalfields where longwall mining is carried on and the bituminous coalfield are all easily accessible to students for inspection trips.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francicso

Sept. 25—The California Miners Association will meet in 16th annual convention at San Francisco, for three days beginning Dec. 9, 1912. One of the chief objects of the convention will be to prepare for a mineral exhibit at the Panama-Pacific International Exposition in 1915. The preparation will be made in conjunction with the director of mining of the exposition management and will embrace not only the representation of the Pacific Coast, but of all the mining states and countries. An especial effort, however, will be made to arrange for an extraordinary exhibit of minerals representative of California and the Pacific Coast mining states. It is believed that the association will be able to gather a larger and better display of California mine products than has ever been assembled at any previous exposition. There has been but little effort on the part of exposition commissions to this end. At former expositions in California, there has been a disposition to give more attention to the romance of the gold seekers of the pioneer days than to the practical exhibition of the products of the mines and the modern methods of ore treatment.

The announcement that President Taft has withdrawn 37,000 acres of oil lands from entry to be devoted to the exclusive use of the government in supplying the navy with oil fuel is interesting. It is estimated that these lands will supply approximately 250,000,000 bbl. of oil, or enough for 25 years, allowing a liberal estimate of the needs of the navy. The lands withdrawn are in the Elk hills in Kern County. There are 58 geographical sections in the area. Of this area 50% is said to be undisputed public domain, 30% is held under patent by the Southern Pacific R.R. and other supposed owners, the remaining 20% is being prospected or operated by independent individuals or companies.

Denver

Sept. 26—Suit was filed recently before the railroad commission by the town of Glenwood Springs against the Colorado Midland, and Rio Grande companies for lower rates on coal from South Cañon to Glenwood Springs, a distance of four miles. It is declared that a charge of $1 per ton for haulage and $3 for switching each car from one road to the other is exorbitant.

The charter of the Colorado Fuel & Iron Co. expires Oct. 21, and its plans for the future have not been made public. It is believed here, however, that this corporation will ask for a charter renewal for 20 years as permitted under the Colorado incorporation laws. Last year, one of the best in the company's history, owed its good showing mainly to the demand for its openhearth rails. The rail mills' capacity is now booked for a year ahead.

It is announced by Victor G. Alderson, president of the state school of mines at Golden, that the new experimental ore-dressing and metallurgical plant built at a cost of $125,000, will be opened Nov. 1. Philip Argall and D. W. Brunton are on the advisory board.

The feud between the union and non-union miners in the northern coal field is still on after over 2½ years' duration and on the night of Sept. 17, at Lafayette, 17 miles from Denver, a revolver and rifle fight took place in which about 400 shots were fired. Fortunately, they were very bad shots for only one man was wounded. The houses of the Bulgarian strike breakers were first bombarded with rocks, and they answered with bullets. The sheriff of Boulder County and his deputies are in control.

Coal tracts in the Yampa field on the survey line of the Moffat road are selling rapidly. For seven years the owners have given many options, but hardly a sale was made, but about two months ago what is known as the Lennox tract of 1720 acres was sold for $100 per acre and a payment was made. This tract is at the mouth of Wolf Creek, about 17 miles west of Steamboat Springs. About the same time 10,000 acres in the Sage and Dry Creek section, south of Hayden, was sold for about $75 per acre, this land being owned by Colorado City men. This week another 4000 acres was sold for $75 per acre. In every case the purchaser's name is being kept secret. Perhaps the knowledge that Newman Erb and his associates have taken over the Moffat road is behind the movement. Application by the receivers of the Moffat road to the district court for authority to issue $300,000 worth of receivers' certificates has been made, and it is stated that Newman Erb will take the issue; $200,000 of this money will be used for snowsheds, switches and turn-outs from timber-line to timber line on either side of the summit of the continental divide, known as Corona Pass, the elevation of the summit being 11,600 ft. This will prevent the congestion of traffic from snow blockade, and permit the hauling of the whole product of the Oak Creek district coal mines during the entire winter, which hitherto has not been practicable. So far all the purchases have been of bituminous and the best steam coals west of the Missouri River, but no anthracite tracts have changed hands.

An important suit now before the United States court of appeals is that of the Government *vs.* the Home Coal & Coke Co. and the Baldy Coal Co., to cancel a patent issued for 80 acres of coal land in the Pueblo district. The entry was made in November, 1904, by an individual who filed a nonmineral affidavit, and the government declares that the American Savings Bank of Trinidad advanced the entry fee on the credit of two other individuals. The entryman, it is stated, had no idea of holding the property, did not even know who paid the fee, and four days after his entry assigned it to the Home company.

Butte

Sept. 25—As the result of a bill passed during the last session of the legislature, the construction of a state sanitarium for the treatment of miners' phthisis and tuberculosis is now under way, and will be completed in about two months. The buildings are being erected about four miles north of Warm Springs in Deer Lodge County. Representative J. E. McNally, of Silver Bow County, introduced the bill, but the appropriation made at that time was found to be insufficient, and it was feared that the plan would have to be dropped, at least until another session of the legislature. In this crisis the officials of the Anaconda Copper Mining Co. were appealed to, and at once gave assistance, with the result that the hospital will soon be completed.

A Montana company started drilling for natural gas within the limits of the city of Great Falls on Sept. 24. The company was granted a franchise last summer by the city and since that time has been making preparations for the work. Charles E. Duffield, of Medicine Hat, who has charge of the work, has finished the erection of a steel derrick and drilling apparatus, and has begun drilling with a 20-in. bit.

It has been announced by Chief Engineer Charles A. Lemmon that the exten-

sion of the Butte, Anaconda & Pacific R.R. will be completed into Georgetown by Nov. 1. The bridge across the forks of Cable Mountain was completed Sept. 24. Most of the mining properties in the Georgetown district have been waiting for the completion of the road before beginning mining and have either been idle or engaged in development work only. The disagreement between the company and the electricians regarding the wages to be paid for electrifying that part of the railroad in Silver Bow County, has not been settled yet, but it is believed that the work will proceed again in the near future, and be carried rapidly to completion in Butte.

According to the report of the U. S. Assay Office at Helena, Madison County led all others in the production of gold during August, with a total of $42,686. The deposits of the various counties in the order of production were: Madison, $42,686; Lewis & Clark, $26,534; Fergus, $22,990; Chouteau, $17,736; Missoula, $7046; Lincoln, $4719; Silver Bow, $2610; Powell, $2332; Deer Lodge, $1706; Broadwater, $1475; Ravalli, $693; Jefferson, $528; Sweetgrass, $84; Granite, $80; Park, $55; a total of $131,274.

Salt Lake City

Sept. 26—The strike situation at Bingham is unchanged. The strikers are quiet, and there has been no disturbance or damage to property. Three hundred special deputies have been sworn in, and are on the Utah Copper ground to prevent possible trouble. All the mines are closed down, and also the concentrating plants at Garfield. The smelteries have a good supply of ore on hand, and are running. Ores from other camps are being received. Bingham furnished the Garfield smeltery with about 1100 tons of ore daily, the remainder, about an equal or greater amount, being received from outside.

The companies are willing to discuss the situation with the miners or committees appointed by them, but not with these committees as representatives of labor unions or agitators, who have brought about the present trouble. The outcome depends largely on the action of the Utah Copper, as other properties will follow. Conferences between mine owners and miners are being arranged for. Many miners have come into Salt Lake City, and some are seeking work in other camps until the present difficulties are adjusted. At Park City and Tintic there is no sign of a sympathetic strike.

At a meeting of Utah mine owners and operators held Sept. 14, it was decided to include operators from other Western states as well as Utah men in the proposed new mining men's organization, if possible, and a committee of three was appointed to correspond with mining men in Nevada, Idaho, Montana, Arizona, etc., with a view to ascertaining the sentiment in regard to the forming of an interstate organization.

Kingman, Ariz.

Sept. 26—Two mines of this county are producing more than $2,500,000 in gold annually and one zinc mine more than 7,000,000 lb. of zinc. In Kingman is the largest electric power plant in the state, supplying the town of Kingman, the Tom Reed and Gold Road mines and several smaller properties. In the River Range, several properties, which at the corresponding stage of development, have probably as good prospects as the Tom Reed or Gold Road, are under development and should soon become producers. At various other places in Mohave county, promising properties are being opened, the chief resources being gold, silver, zinc, copper, lead, tungsten, molybdenum and some gem stones. With its present output and potential wealth it is expedient that county roads shall be so constructed and maitained that they may assist the county's development by a decrease in freighting costs.

The law requiring a bi-monthly payday, which was recently passed by the legislature, is causing some anxious inquiry on the part of the mining companies in the county. The referendum was invoked against the law and acts as a stay in its execution until the question can be voted upon. Judging from the general sentiment of the electors, as learned from newspaper comments from various parts of the state, it is believed that the law will be affirmed. Its only unfavorable effect, so far as can be predicted, may be to cause inconvenience to the companies in their accounting departments, while, on the other hand, it will reduce the financial risk of the miner working for a company operating with a narrow margin of solvency.

Negaunee, Mich.

Sept. 28—Better conditions in iron-ore mining are indicated by the re-opening of the Princeton No. 2 mine at Gwinn, the Smith mine in the same district, and the Chase mine at North Lake, by the Cleveland-Cliffs Iron Co. The same company lately re-opened the Maas mine at Negaunee, and largely increased its force at the Negaunee mine, in the Negaunee Basin. The Republic Iron & Steel Co. is preparing to re-open its Cambria and Hartford mines, and the Breitung-Kaufman companies are opening a new mine at their Lucky Star property, while five miles south the Cascade Mining Co. is hurrying the development of a good-sized mine.

The Negaunee Basin and the Iron River district, which sections J. R. Finlay classed as having the largest ore reserves in Michigan, are both "booming," and men are scarce in these places, as compared to a year ago when men were plentiful, but jobs scarce.

At the American mine, the new iron-ore concentrator is practically completed and will soon be in operation. The mill is built following the ideas of J. R. Thompson, manager of the mine, who has hurried the matter along in order to take care of the low-grade soft ore which it is necessary to mine to penetrate to the high-grade ore. It is estimated that there are 600,000 tons of low-grade ore, containing 40% iron; the concentrator erected at a cost of $150,000, will make a 60 to 65% product. More low-grade ore will probably be encountered as the mine workings are deepened. The flow sheet will be subject to changes as the milling results become available. In general the scheme is as follows: The ore will be reduced to egg size at the crusher plant at the shaft where gyratory crushers are in operation. It will be conveyed by belt conveyor to the mill and will be classified, the larger material being sent to rolls which reduce to ⅜ in. The material is then classified and sent to different size pulsator jigs of new type which will concentrate to 60 to 65% ore, giving the bulk of the product of the mill. The slimes will be treated on Deister tables. The mill is not a hillside plant, and elevators are used.

Spokane, Wash.

A deed of trust to secure the issuance of first-debenture mortgage bonds of $200,000, bearing 7% interest, has been issued by the Central Republic Mining Co., with Thomas H. Brewer, president of the Fidelity National Bank, of Spokane, and Ortho Dorman, as trustees. The bonds will be issued to enable the company to start extensive development of its property, comprising the Valley View, D.D., Fingerboard and Evening Star claims, in the Republic district.

Porcupine

Sept. 26—The Ontario courts have dismissed the petition for a winding-up order of the Crown Charter company, recently filed by R. B. Lamb, who stated that the company owed him a large sum for commissions. This mining company has come through the first of a series of attacks, which will probably be made on it. A threatened combined attack by several shareholders presents a formidable danger. Until this matter is settled, the directors will have a hard time to provide the necessary funds for the continuation of the development work. At the present time, only a few men are working. A special general meeting of the shareholders has been called to consider the question of financing the mine, and a spirited contest is expected between the factions, led by J. P. Heffernan, and the disgruntled shareholders, who do not agree with his proposals for financing.

The Mining News

The Current History of Mining

Alaska

Alaska Treadwell—During August the mills crushed 82,796 tons of ore for a recovery of $197,346 in bullion and concentrates at a cost of $79,596 for operating expenses and $40,871 for construction expense, leaving a net profit of $76,879. The yield was $2.40 per ton of ore milled.

Alaska Mexican—During August, 20,643 tons of ore was crushed for a recovery of $61,771 in bullion and concentrate, at a cost of $28,046 for operating expense and $11,281 for construction, leaving a net profit of $22,444. The yield was $3.02 per ton of ore milled.

Arizona

Gila County

Superior & Boston—Shipments of ore, mostly from the Limestone vein, are being made to the old Dominion smeltery. The crosscut north on the 12th level is in broken, iron-stained schist carrying native silver but no copper. The two crosscuts south are being advanced. On the eighth level, a crosscut is being driven south into the quartzite foot wall, and near the end of the east drift, a drift has been started on a small vein, which is reported to be showing up well in copper.

Arizona Commercial—The steel headframe has been moved from the Eureka to the Copper Hill shaft and is being erected. The Wellman-Seaver-Morgan, 14x20-in. double-drum, geared hoist, is also being moved from the Eureka to the Copper Hill shaft. The only underground work at present consists of enlarging to three compartments and retimbering the Copper Hill shaft below the fourth level. About 20 men are employed. R. R. Boyd is superintendent.

Inspiration Consolidated—A new inclined shaft which will connect with the main tunnel has been started and will be used for lowering men and timbers below the tunnel level. At the Live Oak mine, sinking continues at No. 1 shaft, which is about 575 ft. deep. At No. 2 shaft, drifts are being driven east and west on the 570-ft. level. The east drift will connect with No. 1 shaft, more than 2000 ft. distant. The widening of the Sulphide tunnel has proceeded for 570 ft. from the portal.

Irene—At this silver mine, near Globe, recently leased by J. A. Fleming, one of the two miles of road that will be required has been built, and 1000 ft. of track has been purchased. Work will soon be started on the second and third levels of the 225-ft. shaft.

South Live Oak—Churn-drill hole No. 3 has been discontinued at a depth of 945 ft., and hole No. 4 will be started about 1000 ft. farther west. It is reported that hole No. 3 passed through 65 ft. of 2% copper ore, beginning at a depth of 750 ft., and at 815 ft. passed into barren ground.

Iron Cap—The east drift on the 650-ft. level has been in ore for the last 75 ft. Four cars of ore have been shipped and a fifth is being loaded.

Copper Reef—At this mine, 12 miles south of San Carlos, the oreshoot on the California vein has been opened up for a length of 300 ft. in the drift from the California tunnel. The 220-ft. raise to surface for ventilation has been holed through and the sinking of the winze resumed. A 14-hp. Hendrie-Bolthoff hoist has been ordered for sinking the winze.

Southwestern Miami—Churn-drill hole No. 8 is 910 ft. deep and reported to be still in chalcocite-bearing schist, as is also No. 7, which is now 1206 ft. deep. Hole No. 6 has been discontinued at a depth of 985 ft. without encountering ore and the drill has been moved to No. 4 hole, which was discontinued at a depth of 585 ft. The drilling of this hole will now be resumed.

Maricopa County

It is reported that a deposit of strontium has been found 14 miles south of Gila Bend, and that a German syndicate is considering its purchase. A discovery of gold ore near the Palo Verde bend in Cave Creek is reported, and cinnabar has been found to the northeast of Phœnix.

Kay Copper Co.—This company has purchased a 90-hp. auto truck with trailers to haul ore 42 miles from the mine at Glendale.

Via Mining & Smelting Co.—A test has been made of the smeltery at Roger's Springs, high-grade matte having been made.

Mohave County

Chris Voght has several men at work on his property in the Wauba Yuma district on the west side of the Hualapai Mountains.

O. D. M. Gaddis is negotiating the sale of the Williams tungsten mine. Ore has been shipped during the last few years.

It is reported that a shoot of gold-copper ore of good grade has been opened on Mr. Loper's property at Valentine, in the Cottonwood district, east of Hackberry. There is ore on the dump and Mr. Loper is negotiating for a mill which he intends to remove from Yavapai County.

Tom Reed—The directors recently voted $60,000 for the August dividend.

Yucca Mining Co.—Prospecting has been done on the San Francisco mine with a diamond drill and on the 700-ft. level gold-bearing ore was found, which warrants further exploitation. A drift is now being driven. J. C. Goulding is superintendent.

Cordelia—It is reported that a rich strike has been made in this mine, in Bob Tail basin, just north of Todd basin. Hoffman brothers, the owners, have leased the property.

Nevada-Arizona Gold Mines Co.—The greater part of the machinery for the mill for this company's property in the Music Mountains is already on the ground and several carloads of lumber and some additional machinery will soon be shipped from Los Angeles. Cloyd Richardson is in charge of construction and will make the first run.

Keystone—This old mine, at Mineral Park, is being unwatered by James Uncapher preparatory to examination. In the early seventies, this mine produced rich ore which was shipped to Swansea, Wales.

California

Amador County

Keystone—The inclined shaft is 1800 ft. deep, which is 400 ft. deeper than when the present work was begun. It will be deepened to 2400 ft. C. R. Downs, of Sutter Creek, is manager.

Calaveras County

Hepster—Pay gravel is reported in the lower tunnel at a distance of 2100 ft. from the portal, on the west slope of Stockton Hill, near the town of Mokelumne Hill. The upper channel had been worked previously, but the lower channel has only been prospected; Stephen Hughes, superintendent.

Inyo County

Bishop Creek—The new 10-stamp mill is completed. The stamps weigh 1250

lb. each. The mortar blocks are of concrete. The heavy timbering is of lodgepole pine grown in the vicinity of the mine. Algernon Del Mar, superintendent.

Tiptop—In July and August about 20 tons of ore per day was shipped from this mine, near Buena Vista. The mine is developed on three levels. The total underground excavation is about 1100 ft. The vein on the main level is about 29 ft. wide. The cost of mining is said to be about $1.40 per ton. The shipping ore is broken from a shoot 7 ft. wide. C. M. Thorndyke, of Laws, is manager.

Skidoo Mines Co.—During August, 1142 tons of ore was milled; about 11 days having been lost. Bullion worth $17,613 was produced at a total expense of $8069.

Mariposa County

Original—The first cleanup from the new mill amounted to $5100 from 335 tons of ore crushed. The mill had run 16 days, but for 9 days only 5 of the 10 stamps were dropping. The 200-ft. level has been driven on for about 90 ft. and the drift will be advanced to 300 ft. A quantity of ore has been blocked out, and it is the purpose to keep all the stamps dropping. The mine is dry; 25 men are employed. George W. Egenhoff, of Merced, is superintendent.

Nevada County

Gold Point—This old mine, in Grass Valley, is to be reopened. A new steam hoist will be installed, and the shaft will be deepened to 1000 ft. Alfred Onn is manager.

Siberia—This mine is to be reopened by advancing the lower tunnel. As soon as developments warrant it, the 5-stamp mill will be placed in commission. Walter and Garrett Bigelow are owners.

Birchville—A new 20-stamp mill and electric power will be installed. John A. Bunting, of Oakland, is managing director.

Coan—The shaft is 250 ft. deep and will be deepened to 300 ft. and a drift will be driven toward the Champion vein. C. D. McGonigal is manager and a lessee.

Sierra County

A tunnel has been driven more than 400 ft. into Rattlesnake Peak to tap a rich gravel channel, a fine blue wash and much coarse gold having been taken out of a 40-ft. raise which reaches the rim. This is evidently the same channel as the rich Gibraltar which it joins on the south. H. E. Deal and associates, of Downieville, are owners and operators.

Sierra del Oro—The old tunnel has been cleaned and retimbered and new track laid preparatory to running ahead under the rich shoot of ore recently discovered in this Jim Crow cañon property. Only 150 ft. will be required to reach the shaft and several hundred feet of backs can be obtained. W. I. Redding, John Mayer and associates, of Downieville, are the owners and operators.

Black Hills Standard—This company is operating steadily in the Ragged Top district, handling about 100 tons per day. C. G. Willard is in charge of the mill, and Edward Manion is general manager.

White Bear—Work has just been begun on this old gravel property, reopening the old Dutch tunnel by the present owner, John Costa of Downieville.

Gibraltar—At this gravel property near Downieville an engine house is being erected for a 50-hp. boiler, pump and hoist which are to be installed later to work the rich gravel discovered some time ago by the owners, Kieffer brothers of Downieville.

Monte Cristo—The main tunnel is being extended to the old works to permit prospecting the remainder of the company's ground and the extracting of rich ore that was left above.

Willoughby—The mill has been put in repair and is now handling good ore, a large quantity of which is blocked out. Henry Spaulding is in charge. Dr. R. L. Jump, of Fruitvale, is owner.

Swastika—At this Sierra City mine extensive mill repairs have been made and ore is being crushed from the good shoot recently developed. Lawrence Holley is in charge.

Keystone—A 75-hp. generator for the electric plant has been purchased to replace the old 50-hp. machine. The rich shoot recently struck grows wider and richer with drifting. S. W. Van Syckle has charge.

Siskiyou County

King Solomon—There is a probability that this mine, 14 miles southeast of Sawyers Bar, will be reopened. While the ore is low grade, averaging about $5 per ton, the mine was profitably worked. The ore was crushed in an 8-stamp and a Huntington mill with a combined capacity of 80 tons per day. W. H. Young is manager.

Ball—Engineers have recently examined this mine near Sawyers Bar. It has been idle for two years, and is equipped with a 20-stamp modern mill electrically driven. The mill is 1¼ miles from the mine. The ore is trammed by mules. Consolidated Mining Co., owner.

Advance—The tunnel will be extended and 70 tons of ore mined for a test run by the H. E. Wood Ore Testing Co., of Denver. If the results warrant it there is a probability of the mine being sold. The Siskiyou Syndicate drove the tunnel to 150 ft. and took out 30 tons of high-grade ore.

San Luis Obispo County

Capitola Quicksilver Mining Co.—A deposit of cinnabar 20 ft. wide has been encountered in the 120-ft. tunnel at a depth of 190 ft. in the Capitola mine. The walls are serpentine and sandstone. The tunnel is partly timbered and in good condition for work. The property adjoins the Klau quicksilver mine. C. A. Pemberton, of Klau, and others are owners.

Shasta County

Afterthought—It is announced that a modern smelting plant will be built at Ingot for the treatment of the zinc ores. It is expected to have the plant and the railroad from Bella Vista in operation early in 1913. S. E. Bretherton, of San Francisco, is manager.

Bully Hill Copper Mining & Smelting Co.—It is reported that an application to the government has been made for permission to resume operation of the smeltery at Winthrop. The plant was closed in 1910 because of complaints of the forestry department that the fumes destroyed vegetation. Since then experiments have been made in the smelting of the ores for the recovery of the zinc, which are said to have resulted satisfactorily. D. M. Riordan, of San Francisco, managing director.

Cougar—This mine near Stella formerly known as the Phœnix, has been sold to Dr. F. M. Sponogle of San Francisco. It was formerly a producer, but has been idle for several years.

Gambrinus—The mill is reported to be running on good ore. This is one of the old mines in the Whiskytown district that has been a fair producer.

Colorado

Lake County-Leadville

Ella Beeler—From the lower tunnel of this mine in Iowa Gulch, shipments are being made to the smeltery regularly. Connection has been made with the upper tunnel which will be driven south to the Houston vein.

Lime Tunnel—A fair tonnage of medium-grade zinc-carbonate ore is being taken out by lessees, from this property in California Gulch, about 200 yd. west of the Baby shaft.

Forfeit—From this shaft north of the Baby, lessees are shipping zinc-carbonate ore and filling the bins.

La Platte—From this mine on Rock Hill a carload per day of zinc-carbonate ore is being mined from the 360 level; ore bins and snow sheds are being built with a view of steady production during the winter.

Great Eastern—Work is to be resumed on this property on Prospect Mountain and arrangements have been made with the power company to supply power for the machinery.

Sugar Loaf Consolidated—Twenty tons of good-grade ore is being shipped from this tunnel daily, and the heading is being steadily advanced.

SAN JUAN DISTRICT

Camp Bird, Ltd.—The estimated net profit for August, from all properties of the company, was £28,771.

Iowa-Tiger Leasing Co.—This company is about to be dissolved, and, according to an official report, a final dividend amounting to 11.2% or $1417 has been declared, making the total dividends 121.2% since organization.

Suffolk—In the early "eighties" this mine at Ophir, about 12 miles west of Silverton, was one of the most noted producers of rich gold ore in the southern part of the state, but as depth was gained the free-gold ore of the oxidized zone turned to $8 or $10 sulphide which could not be shipped to the smelteries at a profit. For years the mine has made a poor record, chiefly under the leasing system. Now, however, the Ophir Gold Mines Milling & Power Co., under the management of George B. Pickett, is installing a cyanide plant of 150 tons capacity under the direction of F. L. Veatch. A Bleichert tram has been built to the mine and the old dumps will be treated as well as the mine ore.

Rico-Wellington Mining Co.—Shipments of copper and zinc ore are being made regularly to Salt Lake City. At the annual meeting held this week at Salt Lake City, Jesse Knight was elected president and the office of the company was voted to be moved to Provo, Utah. J. C. Jensen is the mine manager at Rico, Colorado.

Humboldt—This mine in the Sneffels district is an extension on the Ouray side of the range of the Smuggler-Union vein in the San Miguel district. It has been taken over by New York men represented by Charles S. Thomas Jr.; Frederick G. Farish is manager. The purchasers are to spend $60,000 in development during the coming year, build a mill and tramway the next year, and pay $200,000 for the mine the third year. The reserves are estimated at 70,000 tons of $15 silver-lead-gold ore. The mine is credited with a production of $300,000 gross.

King Consolidated Mining Co.—This mine in the Silverton district has been leased and bonded to Joseph Warner, formerly manager of the Silver Ledge mine, and a force of men has been put to work.

Revenue—Platt has increased his force to 90 men and will commence heavy shipments of high-grade concentrates from the mill in Sneffels basin near Ouray.

TELLER COUNTY—CRIPPLE CREEK

South Burns—From this mine on Bull Hill owned by the Acacia company, eight cars of smelting and medium-grade ore were shipped last month by the South Burns Mining Co., the chief lessee.

Black Belle—In this property on Beacon Hill, H. Barbee, lessee, has opened a shoot of rich ore; an electric hoist will be installed at once.

Portland Gold Mining Co.—The output is six carloads and the mill is treating about 500 tons per day. Station timbers are being set on the 1600-ft. level of No. 2 shaft. Fine ore is being mined in the 1500 level which was recovered by being unwatered by the deep drainage tunnel.

Gold Dollar Consolidated Co.—A quarterly dividend of ½c. per share has been paid amounting to $12,500. The company has a balance in hand of $27,957. Company's ore for the quarter brought $20,894 and lessees' royalties $3286. The gross receipts were $55,432.

Idaho

COEUR D'ALENE DISTRICT

Yankee Boy—Two leases have been obtained on this property on Big Creek. It has heretofore been worked intermittently by the owners. One lease covers the ground above No. 4 tunnel, from which all the ore so far mined has been taken. The other lease covers the ground below No. 4 and is in virgin ground. The ore consists chiefly of argentiferous gray copper and galena. Samples of the country rock for several feet on either side of the vein give assays of 6 oz. silver. Work has already been started on the upper lease and ore will be shipped in a short time.

Hecla—This company, which has been paying regular monthly dividends of two cents per share, will increase its regular dividend to three cents per share. A new oreshoot which was recently opened is responsible for the increase. This company is the fourth highest total dividend payer in the Cœur d'Alene.

Bunker Hill & Sullivan—Extensive improvements are to be made to secure a better supply of water to Wardner and Kellogg. Water and electric power for lighting have already been supplied by the company to "Bingville" as the miners' settlement at the mouth of Deadwood gulch is called.

Washington Water Power Co.—This company has begun constructing a high-potential line from its distributing station, at Wardner, to Pine Creek, two miles southwest, from which place branch lines will be run to the Nabob mine, a mile distant, and to the Surprise properties, a distance of two miles. The line will run through the Bunker Hill & Sullivan ground, permission having been granted by that company to build through its property. The power line will be completed to both mines and the current ready to turn on by Nov. 1.

Nabob—This company is now installing a 75-hp. Westinghouse motor, and a 15-drill Ingersoll-Rand compressor, which is being placed close to the face of the main working tunnel. This tunnel is 2000 ft. in and 600 ft. below the surface. Development has been suspended until the compressor plant is operating, but the men are at work on the ditch being built to bring water from Pine Creek to the site where the company is preparing to erect a mill next spring. The canal will be 1¾ miles long, and will furnish ample power for a concentrating plant of sufficient capacity to meet the requirements of the Nabob for many years.

Surprise—This mine was recently consolidated with the Highland Chief, and plans are being made to install new and larger machinery when the transmission line of the Washington Power Co. is completed.

LaClede—Work will continue at this property throughout the winter. Preparations have already been begun, to push the work as rapidly as possible all winter. In previous years work has been stopped in December, and not begun again until April.

IDAHO COUNTY

Bengal—Perry brothers and M. F. Tytler have a lease on this property and are preparing to ship ore to the custom plant in Elk City.

Clarence Ray—The long crosscut tunnel, driven 350 ft. through hard granite, cut the vein last week. The ore is of good milling grade.

Michigan

COPPER

Onondaga—This property, which adjoins that of the White Pine company in Ontonagon County, is operating one drilling machine on the Nonesuch lode. Much drill work is to be done to ascertain the possibilities of this formation on this property. The company was organized in July.

White Pine—A diamond-drill outfit has been sent to this property and much drill work will be done in the vicinity of No. 2 shaft to secure data on the faulting of the formation.

Mohawk—No. 6 shaft of this company is below the 800-ft. level and the lateral openings are developing ground that contains large quantities of mass and heavy copper.

Houghton Copper—This company is developing good ground in its shaft. Drifting south at the 640-ft. level is showing ground of a character equal to that opened at the Superior, and the winze which is being sunk at a depth of about 160 ft. from the north drift is also in good ground. A skip has replaced the temporary bucket and good progress is being made with the development work. The ore from the openings is being placed in a stockpile.

South Lake—Sinking the shaft will be resumed as soon as the air compressor can be put in commission. The shaft is down about 50 ft. and the concrete work to the collar has been completed and the

headframe is ready so that further work can go forward without interruption. It is planned to start the first crosscut to the lode at a depth of about 600 feet.

Wyandotte—This company is sinking a winze on No. 8 lode which was encountered in the crosscut from the exploratory shaft at a distance of about 1100 feet.

Ahmeek—The hoisting engine for shafts Nos. 3 and 4 has been delivered and will soon be erected. A steel rockhouse is to be erected at these shafts.

Calumet & Hecla—At the No. 21 shaft, which is the only shaft that the company is operating on the Kearsarge lode, some excellent ground is being developed in the laterals from the 18th and 19th levels.

Isle Royale—This company has secured a drill core from a depth of about 540 ft., which is well mineralized and has the characteristics of the Kearsarge lode, although the management has not made any official announcement to that effect. Trenching has been started on the outcropping and further developments will be watched with interest.

Mass—The railroad connecting this property with the mill has been overhauled and the bridges put in shape so that traffic can be resumed. This company has sufficient ground opened to maintain production at the rate of about 700 tons daily. Underground conditions new shaft will be started before long are satisfactory and it is probable that a west of "C" shaft.

Iron

Smith—At this mine on the Swanzy Range, lately renamed the Gwinn, operations will shortly be resumed. A concrete shaft is down to bedrock, one of the first shafts sunk by the caisson method, and a little sinking and drifting has been done in rock. When work was stopped several years ago, the drifts were walled up near the shaft to facilitate progress in unwatering, and the shaft was allowed to fill with water.

Chase—This mine, near North Lake, on the Marquette Range, formerly called the Barnes, is to be re-opened. Pumping has been started to unwater the shaft and drifts; the former is 400 ft. deep. Captain Alfred Bone is in charge of underground work at present. The Cleveland-Cliffs Iron Co. shut down at this mine more than a year ago due to lack of demand for ore; the mine is not fully developed.

Cliffs Shaft—This hard-ore mine at Ishpeming is to be equipped with an electric underground haulage system. The east workings are under the city of Ishpeming, extending nearly the width of the city across the business section. The ore occurs in nearly vertical tabular bodies, not of sufficient width to make caving of the surface likely. The drifts will probably eventually be extended to connect with the old Moro mine workings, now closed down and situated on the opposite side of the city.

Minnesota

Cuyuna Range

It is reported that a second deep drill hole near Crosby has cut iron ore at a depth of 1000 ft.; the average depth of holes heretofore drilled has been about 300 feet.

Mesabi Range

Three more diamond drills have been put in operation in the Adams district, near Eveleth, making a total of five drills in use.

Oliver Iron Mining Co.—Ark Terrace, on the west end of the range, is being surveyed by this company, and it has been reported that stripping operations will be started.

Great Northern—This company is about ready to begin stripping operations on Sec. 16, near Marble. It is reported that tracks will be laid in to the pits before cold weather sets in.

Minnesota Mining & Developing Co.—This company is operating the Alberta, a state mine, and 10,000 tons of ore has been sold for delivery this autumn.

Missouri

Joplin District

Nine of the 12 holes put down by S. Y. Ramage in the vicinity of South Carthage, have shown ore at shallow depth and drilling is being continued.

Granby Mining & Smelting Co.—This company is putting its lead smeltery, which recently burned, in temporary shape for smelting the ore on hand. The company is still undecided in regard to rebuilding the plant, because its zinc smelteries are in Illinois.

Continental Zinc Co.—The mill near Carterville is being completely overhauled after six years of continuous running. The roughing jigs will be remodeled and new elevators will be put in. The water is very acid, rapidly corroding steel and iron work.

Cowhead—The mine west of Joplin is being reopened. It is planned to work the lower ground where deposits of sheet ore exist. Pumping is now in progress and is being facilitated by the draining of near-by mines.

Montana

Butte District

Glengarry—Negotiations have been practically completed for the transfer of this property in the southeastern part of Butte, adjoining the East Butte property, to F. M. Bell & Co., of Butte. Before the silver panic of 1892 this property produced more than $500,000 in silver alone, but with the slump in silver it was closed, and except for a small amount of work done by lessees, it has never been reopened.

Deer Lodge County

Southern Cross—A force of 35 men is now employed at this property in the Georgetown district, which was purchased last spring by the Anaconda company. The old two-compartment shaft which is between 300 and 400 ft. deep, is being enlarged to three compartments, and retimbered throughout. As soon as this work is completed the shaft will be sunk an additional 200 ft. The mine will be equipped with electricity, and for that purpose a survey has been made for a power line to the mine from the Flint Creek power line.

Pyrenees—Preparations are being made to install an uptodate plant at this property, in the Georgetown district.

Holdfast—Robert Lindberg, owner of this mine in the Georgetown district, has between 20,000 and 25,000 tons of ore blocked out in preparation for extensive mining after the railroad's completion. He is mining a small amount of ore and making occasional wagon shipments.

Big Bill—A force of 15 men has been put to work at this property by Rodgers, Rodgers & Gordon, the owners, who expect to begin mining and shipping when the railroad is extended to Georgetown.

Granite County

Granite-Bimetallic—A cyanide plant recently installed near Phillipsburg for the treatment of tailings has been in operation for about two weeks, and is treating about 50 tons per day. John R. Lucas, manager of the company, states that some changes will be necessary in the equipment, after which the amount treated will be more than doubled. Charles McClure, of St. Louis, president of the company, is now at the property to superintend the needed changes.

Lewis & Clark

Barnes-King Development Co.—This company has taken an option on the Piegan-Gloster group of gold claims in the Marysville district, and Manager George McGee, of the Barnes-King company, has left for the property to let a contract for an extension of the tunnel to cut a shoot in which considerable ore was blocked out during previous operations. The price asked is $175,000, with deferred payments, the last one of $50,000 to be made July 20, 1914; or in case the option is taken up by Mar. 20, 1913, the price is set at $100,000. The mine still contains large bodies of low-grade ore running about $6 per ton, which with modern methods can be mined profitably. The group consists of about 200 acres of patented claims extending over a mile on the Gloster vein, as well as several unpatented claims. Negotiations are being made for an electric power line to be carried to the property from the Missouri River Power Co. plant.

Madison County

Blowout—An important mining deal has just been made in the Rochester mining district, by the purchase of this copper property by a Boston syndicate from Connors and Forvilly, of Rochester. The mine has been worked to a slight depth. The new owners intend to sink a 500-ft. shaft, at once, and have ordered the necessary machinery. Excitement has been caused by the sale, and many claims in the vicinity have been staked in the last few days.

Valley View—A vein of steel galena carrying gold and silver has been opened in this property near Twin Bridges, in Goodrich gulch. A shipment has been made to Salt Lake, and preparations are being made for another shipment. The property was prospected by Mrs. Florence Kidder and daughter, who organized the Valley View Gold Mining Co., to operate it.

Nevada

Clark County

James M. Hill, of the U. S. Geological Survey, is making an examination of the Yellow Pine and other mines preparatory to a preliminary report on the district.

Yellow Pine—The production for August consisted of 1200 tons of zinc, and 350 tons of lead concentrate; crude ore was also shipped. Development work is proceeding rapidly, and a new shoot of lead-zinc carbonates has been encountered north of the shaft, on the third level. Orders have been placed with the Atlas Car & Mfg. Co. for six additional 10-ton cars for use on the narrow-gage railroad, and the company is contemplating the purchase of another locomotive.

Volcano—Zinc-carbonate ore has been discovered by the Williams brothers, lessees of this property. A road has been built to the shaft, and two cars of ore have been shipped during the month. The ore is hauled by wagon 12 miles to Jean, and sufficient ore is blocked to insure steady shipments for several months.

Monte Christo—This property, which a few years ago produced several thousand tons of high-grade zinc-carbonate ore, has been leased to Duncan & Fredrickson, who have a force of men engaged in development work. The ore was produced from a large vein, which faulted close to the surface, and the lessees will search for the vein on the opposite side of the fault.

Bullion—At a depth of 100 ft. in the shaft, the vein of galena has increased to a width of four feet. Two cars of rich lead ore were shipped during the month, all ore having been extracted in development work.

Lander County

Glasgow & Western—Captain Case, the manager, reports that the new mill is running smoothly and that a supply of ore for two years' milling is broken in the mine.

Lyon County

Mason Valley—The enlarged furnace has been blown-in.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended Sept. 21, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,700	126,769
Tonopah Belmont	3,083	88,200
Montana-Tonopah	1,075	39,273
Tonopah Extension	1,075	37,834
West End	980	28,122
Midway	50	470
MacNamara	460	13,685
North Star	.....	170
Mizpah Extension	.....	40
Jim Butler	300	1,600
Totals	10,723	336,163
Estimated value	$268,075	.....

Tonopah-Belmont—A new vein of high-grade ore, now over five feet wide and its full width undetermined, has been opened on the 12th level of the Belmont mine. The shoot of rich ore in the Shaft vein on the 1100-ft. level has been proved for a length of nearly 200 feet.

North Star—An important development is reported on the 1250-ft. level, where a southeast crosscut near the Belmont boundary passed through 30 ft. of quartz. On the hanging wall was 14 in. of rich ore which in 20 ft. of drifting widened to four feet. The ore carries one ounce of gold to one ounce of silver, whereas the usual proportion is one ounce of gold to 80 oz. of silver.

Jim Butler—The Fraction vein on the 600-ft. level is now more than 30 ft. wide with several streaks of good ore.

Gypsy Queen—The north crosscut from the 600-ft. level has cut a vein of low-grade ore, three feet wide and drifting has been started.

Tonopah-Sully Mining Co.—This company was recently organized to operate the property that George Wingfield had sold to W. C. Lamb, of Tonopah and eastern associates, the Sully group of five claims situated between the Little Tonopah and Tonopah merger properties.

Telluride Consolidated Gold Mines Ltd. This company, operating property eight miles east of Beatty, has developed some cinnabar ore to a depth of 470 ft. and is now installing a Scott furnace having a capacity of 40 tons per day.

White Pine County

At a recent meeting of the trades unions at Ely it was decided to make a request for a raise in wages of 50c. No demand for recognition of the unions was made nor was there threat of a strike if the request were not granted. A dispatch of Sept. 28 states that a voluntary increase of 25c. per day was granted to all men receiving $3 per day or more, and 20c. increase to all receiving less than $3 per day.

Utah

Juab County

Tintic shipments for the week ended Sept. 20 amounted to 193 cars. This is about the normal output. Increase in shipments was made by the Eagle & Blue Bell, May Day, Mammoth and Grand Central.

Chief Consolidated—The size of the shaft is restricting operations to some extent, and after the first of the year it will probably be enlarged from one to three compartments.

Eagle & Blue Bell—When the new orebins are completed, this company will be in a position further to increase shipments. More ore than ever before in the history of the company is being marketed. Shipments for the week ended Sept. 20 amounted to 10 cars, the ore coming from the 700- and 1200-ft. levels. Ore has been drifted through on the 1350-ft. level.

Opohongo—The output at present is four to six cars weekly, and earnings are in excess of the dividend rate.

Yankee—This company is meeting all operating expenses by shipments of zinc ore. Four cars were marketed during the week ended Sept. 20. Development is being done on the 1800- and 1900-ft. levels, and a mineralized fissure has been cut in the east drift on the 2000-ft. level.

Black Jack—Milling ore has been blocked out between the 600-ft. level and the surface.

East Tintic Development—Buckley & Scott, who have a lease on this property, have sent out their first car of zinc ore.

Dragon Consolidated—A drift is being driven toward the south on the 600-ft. level. Stoping on the ore reached from the No. 1 workings of the Iron Blossom has been discontinued for the present.

Carisa—Shipments are being made by lessees.

Beck Tunnel—Connections have been nearly completed between the main working shaft and the Humbug oreshoot, about 30 ft. still remaining to be driven. From 15 to 20 tons of ore daily are being mined.

Victoria—Orders for new machinery have been placed, and electrical power will take the place of steam. A large compressor has been ordered to replace two small ones now in use. Three cars of ore were shipped during the week ended Sept. 20.

Iron Blossom—The raise from the 600-ft. level of the No. 3 shaft cut 25 ft. of copper ore some time ago, and this orebody has been drifted on about 300 ft. Development is in progress on the 500-ft. level south of the No. 1 workings. Some silver-lead ore has been opened here along the main Iron Blossom break, 100 ft. to the south of previous discoveries

in that part of the mine. The raise driven through siliceous ore is now in lead-carbonate ore of good grade.

Eureka Leasing & Mining Co.—The main tunnel of this company's property in the Nebo district is in about 1200 ft. and development is being continued. Three cars of ore have been shipped so far during the present year.

Eva—This property, southwest of the Nebo Highland, is shipping steadily. A new boarding house is being built to accommodate the increased working force.

SALT LAKE COUNTY

Utah Copper—The August production was 11,841,044 lb. of copper.

Ohio Copper—The assessment of $1 per share is now reported as fully paid.

Utah Metal—A fissure carrying lead, zinc and iron has been cut in this company's tunnel between Tooele and Carr Fork. This is the sixth fissure so far cut, and the face is approaching ground known to be mineral-bearing.

Alta Consolidated—Some zinc ore has been developed at this property, and it is hoped that shipments of this material can be made to the smelteries of the Middle West.

Columbus Consolidated—This property, as well as all other Alta properties, has been closed down on account of a strike.

Cardiff—Steady shipments are being made, and winter supplies are being hauled to the mine.

Peruvian—The first shipment for this season amounted to 157 tons of lead-silver ore with some gold and copper, coming from tunnels Nos. 1, 2 and 3. This property adjoins the South Hecla on the west.

Michigan-Utah—The 4½-mile tramway down Little Cottonwood cañon has been overhauled, and the buckets adjusted. Several tryouts have been made.

Washington

OKANOGAN COUNTY

Dividend—This company contemplates the installation of an air-compressor plant on its property in the Oroville district. A fine shoot of ore has been found.

SNOHOMISH COUNTY

Florence-Rae—This company is making preparations for building a branch road from its property in the Sultan Basin district to connect with the Great Northern Ry. at Startup.

STEVENS COUNTY

Sunday—After being shut down for several months, operations have again been started at this mine near Meyers Falls.

Clugston—This company recently made a shipment of three carloads of silver-lead ore. J. R. Brown, of Colville, is manager.

United Copper—A fine shoot of chalcopyrite and gray copper has been found in this mine near Chewelah. Conrad Wolff, of Spokane, is president.

Canada

BRITISH COLUMBIA

Inland Mining Co.—This company, operating mines at Paulson, has commenced milling ore from the main shaft. This is free-milling gold from which gold-bearing iron and silver-lead concentrates are also produced. The steam-power plant, mill and compressor were recently overhauled, and now the production pays all the expenses of operation, including development work. The head office of the company is at Walla Walla, Wash.

Beatrice—This mine, in the Lardeau district, has been sold to British Columbia and Washington men, who have made plans for extensive development work. The mine, which produces rich argentiferous lead ore, is opened to the 250-ft. level. About 1000 tons of ore has been produced from development openings, and shipped to the smeltery, at Trail. The tunnel will be driven to intersection with the vein at the 350-ft. level next summer.

Lucky Jim—The new tramway at this mine, in the Slocan district, is in operation, and a shipment of zinc ore is ready in the bins. This will be the first shipment since the fire that destroyed the mine buildings two years ago. The railroad, which was also destroyed by fire, has been completed to Bear Lake, and regular service is maintained. The company is considering plans to erect a concentrator on a site between the mine and Slocan Lake, where there is water power.

ONTARIO—COBALT

Shipments of ore and concentrates, in tons, from Cobalt for the week ended Sept. 27, and for the year to date:

Beaver	30.86	275.12
Buffalo	.....	864.57
Casey Cobalt	.....	212.15
City of Cobalt	.....	887.99
Cobalt Lake	19.80	683.45
Cobalt Townsite	101.27	1,355.95
Chamb.-Ferland	41.28	362.33
Coniagas	.....	1,515.41
Crown Reserve	.....	351.10
Drummond	52.75	383.05
Hudson Bay	.....	538.47
Kerr Lake	30.30	560.22
La Rose	118.80	2,656.03
Lost and Found	.....	15.00
McKinley-Darragh	43.90	1,963.78
Nipissing	73.78	1,704.50
O'Brien	.....	453.31
Penn.-Canadian	.....	29.70
Provincial	.....	22.22
Right of Way	.....	242.82
Timiskaming	.....	797.01
Trethewey	.....	381.54
Wettlaufer	.....	265.74
Colonial	.....	63.14
Dominion Reduction Co	56.64	56.64
Totals	569.38	16,641.24

ONTARIO—COBALT

Kerr Lake—The annual statement for the year ended Aug. 31 shows cash on hand amounting to $491,615. The gross production for the year was 1,855,494 oz. against 2,388,420 oz. in the previous year. The cost of production was 18.34c. as against 14.7c. in 1911 and 13.3c. in 1910.

Timiskaming—This company has secured the Cochrane lot, south of the present property. A new shaft will be sunk on the southern extremity of the Cochrane vein, and the property will be thoroughly developed.

Townsite—In order to explore that portion of the property underlying the tailings pond of the Northern Customs Concentrator, Ltd., No. 1 shaft will be enlarged and deepened.

Casey Cobalt—The 10-stamp mill commenced operations this week.

Calcite Lake—A judicial sale of the assets of this company has been ordered under a winding-up order.

ONTARIO—PORCUPINE

Pearl Lake—The crosscut on the 400-ft. level has penetrated what is believed to be the extension of the McIntyre vein. This confirms the results obtained with the diamond drill, where ore was found between 400 and 800 feet.

Dome—The incline from the 100- to the 45-ft. level has broken through. Several raises had been connected with the 100-ft. level and in a short time practically all the ore will be raised from there.

Hollinger—Production is now being maintained at about $200,000 per month.

Hughes—A five-stamp mill will be installed.

Schumacher—The north crosscut ran into sand, and the mine workings are filled with sand and water from Pearl Lake. Some of the buildings in the town were threatened with destruction.

Newfoundland

Tilt Cove—The production from these mines of the Cape Copper Co., for August was as follows: East Mine, 654 tons of 3.25% copper ore; South Lode, 450 tons of 3.75% copper ore; West Bluff, 145 tons of 7.28% copper ore.

Mexico

SONORA

Compañia de Minas de Mexico—The old concentrating mill of this company, operating in the Sahuaripa district, is being reconstructed; the remodeled plant will have a capacity of 100 tons per day. A rich oreshoot has been opened between the eighth and ninth levels. The company is planning to blow-in the 100-ton smeltery in the near future and resume shipping concentrates and matte. W. E. Pomeroy, of Tonichi, is general manager.

Lucky Tiger-Combination Gold Mining Co.—During August, 6130 tons of ore was milled and 7478 tons of old tailings cyanided. The gross value of the bullion, concentrates and ore, produced and shipped, was $146,023; and the costs amounted to $83,298.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, Oct. 2—Coal trade in the West continues strong and active. The complaints of car shortage and slow transportation are on the increase.

The seaboard bituminous trade is also strong. Car shortage and the West Virginia strike are limiting supplies, and prices are higher than for some time.

Anthracite mines are still active, but dealers are complaining that supplies come in slowly and that it is hard to get orders filled.

ADD COAL TRADE REVIEW.

German Coal Production—Coal production in the German Empire seven months ended July 31, metric tons:

	1911	1912	Changes
Coal	92,278,434	100,485,485	I. 8,207,051
Brown coal	40,818,351	46,075,323	I. 5,256,972
Total coal	133,096,785	146,560,808	I. 13,464,023
Coke made	14,624,969	16,166,998	I. 1,542,029
Briquettes m'de	12,111,607	13,710,896	I. 1,599,289

Of the briquettes reported this year 10,735,368 tons were made of brown coal or lignite.

German Coal Trade—Exports and imports of fuel in Germany seven months ended July 31, metric tons:

	Exports	Imports	Excess
Coal	17,833,020	5,401,116	Exp. 12,431,904
Brown coal	29,110	4,220,154	Imp. 4,191,044
Coke	3,160,950	325,802	Exp. 2,835,148
Briquettes	1,532,834	99,290	Exp. 1,433,544
Total	22,555,914	10,046,362	Exp. 12,509,552
Total, 1911	19,032,807	10,662,979	Exp. 8,429,828

Exports this year included 22,556 tons of coke to the United States.

Austrian Coal Trade—Imports and exports of fuel in Austria half-year ended June 30, metric tons:

	Imports	Exports	Excess
Coal	5,655,023	324,292	Imp. 5,330,731
Brown coal	18,624	3,454,895	Exp. 3,436,271
Coke	420,847	163,764	Imp. 257,083
Briquettes	46,808	69,733	Exp. 22,925
Total	6,141,302	4,012,684	Imp. 2,128,618
Total, 1911	5,291,872	4,043,863	Imp. 1,248,009

The imports and exports are chiefly from and to Germany.

Iron Trade Review

New York, Oct. 2—The iron and steel markets continue strong and active, the chief point now being the endeavors of the mills to make deliveries as fast as they are needed. Prices continue to advance here and there. Car shortage and scarcity of labor are still factors in the trade.

The iron and steel market shows an accretion of strength all along the line. While specifications on regular contracts for finished steel have not increased, they continue to average above current shipments, so that the mills are falling farther behind in deliveries, while business for the new year is opening up rapidly, and even for such delivery it is a sellers' raher than a buyers' market. In sheets, for instance, in which order books were formally opened last week, most of the mills show a decided reserve as tc selling for the new year and doing little more than to try to take care of their regular customers. A number of the sheet mills are asking advances over current quotations for any delivery they can make.

The feature of the market is still active contracting for pig iron. Basic iron is in large demand and buying of foundry has been on a liberal scale. Prices are advancing and quotations are unsettled, especially on contracts for 1913 delivery. Several merchant furnaces are preparing to blow in, and others are reported getting ready. Scarcity of labor and coke, and possibly of ore later, may limit the increase in production.

Southern Pig Iron Rates—Proposed changes in the pig-iron rates from a number of Virginia furnaces to Philadelphia over the Chesapeake & Ohio and the Norfolk & Western have been suspended by the Interstate Commerce Commission until Dec. 30, pending an investigation into their reasonableness. Heretofore it is stated, the railroads "have published two sets of rates for the transportation of pig iron from the furnaces in Virginia to Philadelphia; one rate applicable by Hagerstown Transfer, Md., or Shenandoah Junction, W. Va., the other rate being applicable by Norfolk, Va. The rate by Norfolk was in each instance 20c. per gross ton less than the rate by other junctions, and was said to be made to meet water competition. For instance, the present rate from Bristol, Va., to Philadelphia is $3.35 per gross ton by Hagerstown Transfer or Shenandoah Junction and $3.15 by Norfolk. The supplements which have been suspended eliminate the lower so called water-competitive rates, thereby advancing the rates by Norfolk 20c. per ton."

Baltimore

Sept. 30—Exports for the week included 190,620 lb. steel plates to Liverpool. Imports included 80 casks spiegeleisen and 898 tons ferro-manganese from Liverpool; 41 casks manganese ore from Hamburg; 6200 tons manganese ore from Bombay, India; 6164 tons pyrites from Huelva, Spain; 13,178 tons iron ore from Cuba.

Birmingham

Oct. 1—Sales of pig iron by Southern furnaces continue and prices are firm. The quotation of $13 is no longer given: $13.25@13.50 is the present price for No. 2 foundry, with $14 quoted for next year's deliveries. Two additional furnaces will start up very soon and two more are being made ready to start a little later. Stocks in furnace yards are no longer in consideration, and everything promises good business.

The steel works and rolling mills are all busy, with promise of continuing active for some time.

Charcoal iron is in more demand and prices are firmer. The scrap market is looking up.

Chicago

Oct. 1—General conditions in the iron market remain strong for producers and sellers; there is a large demand for finished materials of every sort and pig-iron sales, while not individually large, are in the aggregate sufficient to maintain prices firmly.

The pig-iron market is the average user's, sales being numerous and of small tonnage—up to 2000 tons each. Buying in general is for the first half; those melters who have been restricting their purchases to the first quarter are buying for the second quarter and those coming into the market for supplies beyond the first of the year are contracting generally for six months' requirements A little iron is sold occasionally for last-quarter needs.

Northern No. 2 foundry coke iron brings $17@17.50 at the furnace, making the delivered price about $17.50@18. Southern pig iron of corresponding grade brings $13.50@14.50, Birmingham, which means $17.85@18.85, Chicago. The wide range given for Southern is because of varying local conditions and furnace demands; most Southern No. 2 brings, probably, $13.50 and some is said to have been sold at $13.25 in the last week, though no such price is now generally quoted.

In the market for finished materials more sales are being made for 1913 delivery because of the pressure from consumers, the local mills having been reluctant for several weeks to go beyond

the first of the year. Bars are in heavy demand and sell at about 1.45c. for iron and 1.53c. for soft-steel bars. Railroad supplies are in heavy demand, both standard rails and track fastenings being generally sought. Structural material has a steady sale over a wide territory; sheets, plates and minor lines are in large demand, with nearly every manufacturing line showing prosperity and promise of continued heavy requirements.

Cleveland

Sept. 30—September tonnage down the Lakes has been kept back by car shortage on the railroads in the Lake district and by scarcity of labor. For the last week also fogs and bad weather have delayed the movement of boats.

Pig Iron—The market is strong and sales have been heavy, on advancing prices. Basic is in special demand. Bessemer is quoted $16.25@16.40; basic, $15.75@15.90; No. 2 foundry, $15.75@16, Cleveland delivery.

Finished Material—Sales continue large in almost all lines, and there is a good deal of buying for the first quarter of 1913. Prices on bars, plates and structural material are moving upward.

Philadelphia

Oct. 2—Active buying has prevailed throughout the Eastern market, much of the buying being of basic for early delivery. Western buyers are seeking accommodations in the East without closing much business. More foundry iron is being inquired for than the furnaces can possibly furnish in the times specified. Stocks are practically exhausted and contracts for first-quarter delivery are being booked only at top figures. Very little interference is felt from Southern iron, though some sales have been recently closed, growing out of inquiries made two or three weeks ago and at prices then asked. Cast-iron pipe makers are again in the market and inquiries amount to about 7000 tons, all for next year's delivery. Forge has advanced quotably 50c. a ton. Malleable is inquired for in small lots for next year's delivery. A higher range of prices seems to be inevitable. New Jersey and New England consumers have withdrawn inquiries presented two weeks for the reason that furnace interests are indifferent and where they quote are asking the very highest figure. Eastern No. 2 X foundry sold today at $17.25; Virginia is offered at $17.50; gray forge $16@16.50; basic the same and low phosphorus $21.50, at which business has been done.

Billets—Sales of billets for the past week were made at $28, forging billets $32, but openhearth billets could not be had at the above figure today. Billet capacity is practically exhausted and yet there are three or four large concerns who are in need of early deliveries.

Bars—Bars have advanced slightly over last week, not through higher quotations but by offerings of premiums. It is a question whether common iron could be had at 1.40c. Car-building requirements are urgent.

Sheets—Sheets are again advanced on all kinds and blue annealed is up $1 a ton.

Pipes and Tubes—Further activity is reported in pipes and tubes and a few buyers have been obliged to bid above the quoted rates for special accommodations.

Plates—The monotonous activity in plates is reported on all sides. Mills are managing to keep abreast of demand by accumulating orders on their books for still more remote delivery. Some smaller interests requiring a few hundred tons appear to be out in the cold.

Structural Material—Orders for structural material continue to crowd in on a basis for moderate-sized lots of 1.65c. for sheared and 1.70c. for universal plates, with higher quotations for delivery after October.

Scrap—All kinds of scrap are in active demand and stocks are at a minimum.

Pittsburgh

Oct. 1—Cold-rolled shafting has been advanced two points, under date of today, making the new discounts 60% off in carload and larger lots and 55% off in small lots. The advance amounts to about $2 a ton, the total advance from last February's low point being about $8 a ton.

The mills have a larger volume of steel-bar business on books than of any other commodity, most of them being practically sold up into next April, with specifications for a large part of the business already on books. The regular market is 1.35c. on bars, this applying to first-quarter business, while for delivery this year premiums are usually obtained. Plates and shapes are 1.40@1.45c. for extended delivery, the lower price being that of the Steel Corporation, the higher that of most if not all of the independents. The latter are able to dispose of a large tonnage as the steel corporation is rather reserved in making sales, being already so well sold up.

Pig Iron—The advance in the local pig-iron market has been spectacular, as after a very slowly rising market for months the market in the past fortnight has been advancing by 50c. at a time, and is easily $1 a ton higher than two weeks ago. While sales are being made as prices advance many buyers are holding off, since they are covered for the next three or four months. Furnaces, however, are almost equally reserved as to making sales. There have been several transactions in bessemer iron at $16.50, Valley, which now represents the minimum of the market. Basic has sold at $15.50 to the extent of at least 10,000 tons, and it is questionable whether any more can be secured at this figure. We quote the market as follows: Bessemer, $16.50@16.75; basic, and No. 2 foundry, $15.50@16; gray forge, $15@15.50; malleable, $15.25@15.75, all f.o.b. Valley furnaces.

The bessemer and basic pig iron averages for Sepember, as compiled by a large interest in the trade from actual transactions, are announced at $15.962 for bessemer and $15.134 for basic, both at Valley furnaces, these representing advances over August of $1.43 for bessemer and $1.13 for basic.

Ferromanganese—Several sellers have advanced their price on contract ferromanganese $3, to $59.50, but there seem still to be sellers at the old price. We quote the contract market at $56.50@59.50, and the prompt market at $62@65, all f.o.b. Baltimore.

Steel—The market has become almost unquotable, since there are only occasional sellers for this year's delivery, and for next year the mills are all refusing to quote, giving as a reason that they will have less unfinished steel to spare from their finishing mills, and will in addition have to carry over from this year a large volume of unfinished steel obligations. Brokers are occasional sellers of steel, but have little to offer. We quote as approximately representing the market: Bessemer billets, $25; bessemer sheet bars, $25.50; openhearth billets, $26; openhearth sheet bars, $26.50; forging billets, $32; rods, $27@28, all f.o.b. mill, Pittsburgh or Youngstown.

Sheets—Specifications on sheet contracts continue excellent. Mills are selling cautiously for first quarter shipment, but are picking their customers and are not pressing sales in any instance. For early deliveries premiums are readily secured. Operations are practically at full capacity, subject to shortage of steel and of labor at times. We quote black sheets at 2.15c.; galvanized at 3.30c., blue annealed at 1.55@1.60c., painted corrugated at 2.35c. and galvanized corrugated at 3.35c. per pound.

St. Louis

Sept. 30—The pig-iron market is strong. Buying has been chiefly in small lots. Most of the large consumers are supplied for the present, and the higher prices asked have rather discouraged inquiries. Southern No. 2 foundry is $13.25@13.50 Birmingham—$17@17.25 St. Louis, and sellers are asking $14, Birmingham, for 1913 contracts. Northern No. 2 is selling at $17.25@17.50. There has been some inquiry for basic iron.

Coke is higher and irregular, $5.75@6, St. Louis, being asked for good foundry.

Iron Ore Trade

Additional sales of Wabana ores from Newfoundland to Eastern furnaces are reported. High ocean freights are interfering with sales of Swedish and Spanish ores in the East for next year. Even with Cuban ore the rates are high and it is not easy to get vessels enough for the trade.

Imports and exports of ores in the United States, seven months ended July 31, long tons:

	1911	1912	Changes
Iron ore, imp.....	1,002,713	1,180,053	I. 177,340
Iron ore, exp.....	370,502	498,750	I. 128,248
Manganese, imp....	97,293	120,310	I. 23,017

Imports are from Cuba, Sweden, Spain, Newfoundland and Canada. Exports are chiefly to Canada.

Foreign Iron Trade

British Iron Prices—An unusual condition has prevailed in the market for some time, prices in Great Britain being considerably higher than here. Some quotations from the London *Iron and Steel Trade Journal* of Sept. 14 are: Middlesboro No. 2 foundry, $15.90; Scotch pig, $17.34; West Coast hematite (bessemer pig), $19.08. Some finished prices are: Common bars, $39.60 per ton; refined bars, $45.60; angles, $38.40; plates, $39 @42.60; steel rails, $31.20 per long ton.

German Foreign Trade—Exports and imports of iron and steel and of machinery in the German Empire, seven months ended July 31, metric tons:

	Exports	Imports	Excess
Iron and steel..	3,425,706	387,230	Exp. 3,038,476
Machinery.....	287,617	53,226	Exp. 234,391
Total.....	3,713,323	440,456	Exp. 3,272,867
Total, 1911.....	3,280,855	395,296	Exp. 2,885,559

Total increase in exports 432,468 tons; increase in imports, 45,160 tons.

Metal Markets

New York, Oct. 2—The metal markets have been generally firm, with no marked changes. Speculation in tin is still active.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold			
Aug. 1912..	$ 2,498,472	$ 5,576,900	Imp. $3,078,428
" 1911..	480,799	4,105,331	Imp. 3,624,532
Year 1912..	43,159,972	34,589,111	Exp. 8,570,861
" 1911..	15,910,449	40,473,010	Imp. 24,562,561
Silver			
Aug. 1912..	5,574,644	3,952,279	Exp. 1,622,365
" 1911..	4,869,359	3,653,329	Exp. 1,216,030
Year 1912..	45,834,920	32,652,869	Exp. 13,182,051
" 1911..	44,587,570	29,534,724	Exp. 15,052,846

Exports from the port of New York, week ended Sept. 28: Gold, $50,750; silver, $1,356,125, chiefly to London. Imports: Gold, $573,548, from Mexico and South America; silver $90,564, principally from Central America.

Gold—The price of gold on the open market in London remains at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. More gold, $5,250,000 in all, has been taken in London for export to New York.

The cost of bringing gold bars across the Atlantic has been increased this season by an advance in freight rates on bullion shipments from 5-32 to 3-16, and in the insurance rate from 5c. to 7½c. per $100. This advance resulted from the "Titanic" disaster.

Iridium—An advance is reported, pure metal being quoted at $64@65 per oz., New York.

Platinum—Business is fair. The market is well supported and there is no change in quotations. Dealers ask $45.50 per oz. for refined platinum and $48 per oz. for hard metal, up to 10% iridium. The foreign market is firmer.

Silver—The market shows an upward tendency, owing to expectation that the Indian government may require more metal during the next few months; and in addition, China seems to be able to make some purchases.

SILVER AND STERLING EXCHANGE

Sept.-Oct.	26	27	28	30	1	2
New York....	63⅜	63⅜	63⅜	63⅜	63⅞	64⅛
London.....	29¼	29¾	29 7/16	29 7/16	29⅛	29⅛
Sterling Ex..	4.8520	4.8510	4.8530	4.8530	4.8525	4.8525

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Sept 19, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes
India.....	£5,829,800	£7,365,700	I. £1,535,900
China.....	989,700	933,500	D. 56,200
Total.....	£6,819,500	£8,299,200	I. £1,479,700

Indian currency reserve figures show 1310 lakhs silver coin, 30 lakhs bullion under coinage and 325 lakhs in transit; a total of 1655 lakhs of rupees, or 1007 lakhs less than at the corresponding date last year.

Copper, Tin, Lead and Zinc

Copper—Up to the end of last week, Europe continued to place good-sized orders, while domestic consumers, being well supplied, took no interest in the market during the entire week. Since the disturbances in the Balkan have become more acute, European buyers have also withdrawn. The unsettled conditions abroad have been reflected in a sharp decline in the standard market, which makes refined sorts in Europe available at lower prices than the quotations ruling here. The close is undecided at 17⅝@17⅞c. for Lake copper, and 17.45@17.50c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 17.30@17.40c. as an average for the week.

The advance in the London market culminated last Monday, when spot standard sold at £75 9s., and three months at £80 3s. 9d. Since then there has been a violent decline, due to political causes, and the close is cabled weak at £77 3s 9d. for spot, and £78 3s. 9d. for three months.

Copper sheets are 23@24c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 19@19¼ base, carload lots at mill.

Copper exports from New York for the week were 6369 long tons. Our special correspondent gives the exports from Baltimore at 1162 tons for the week.

Visible stocks of copper in Europe on Sept. 30, are reported as follows: Great

NEW YORK

Sept.-Oct.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
26	17⅝ @17⅞	17.50 17.55	50¾	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
27	17⅝ @17⅞	17.50 17.55	50⅝	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
28	17⅝ @17⅞	17.50 17.55	50⅝	5.10	4.90 @4.95	7.45 @7.50	7.35 @7.40
30	17⅝ @17⅞	17.45 17.55	50⅝	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
1	17⅝ @17⅞	17.45 17.50	50⅛	5.10	4.90 @4.95	7.45 @7.50	7.30 @7.35
2	17⅝ @17⅞	17.45 17.50	50⅛	5.10	4.90 @4.95	7.45 @7.50	7.30 @7 35

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Sept.-Oct.	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
26	79	79 11/16	84	232	230	22¼	27¾
27	79	79 11/16	84	230½	228¾	22¼	27⅝
28	....	....	....	.....	.....	....	....
30	79¼	80 1/16	84¼	231	229½	22¼	27⅝
1	78⅞	79¾	84	227⅞	226¼	21¾	27⅝
2	77 13/16	78 1/16	82¼	227½	226¼	21¾	27⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Britain, 29,550; France, 7580; Rotterdam, 450; Hamburg, 3290; afloat from Chile, 1830; afloat from Australia, 5250; total, 47,950 long tons, or 107,408,000 lb. This is a decrease of 1520 tons from the Sept. 15 report.

Brass Prices—The following list was announced on Oct. 1 by the American Brass Co.: Sheets, high brass, 18⅝c. net per lb., low brass, 20½c. Wire, high brass, 18⅜c.; low brass, 20½c. Rods, high brass, 18⅜c.; low brass, 21¼c. Tubing, brazed, 23¼c.; open seam, 22⅛c. Angles and channels, 22½c. Scrap allowances, 13⅛c. net per lb. for high brass and 14½c. for low-brass scrap.

Tin—The statistics which were published at the beginning of this month show an increase of almost 2000 tons in the visible supplies, and served as a damper upon the bullish sentiment which was apparent in the London market during the week. The latter reached its highest point on Sept. 26, when it touched £232 for spot and £230 for three months' tin. From this point, it declined yesterday about £5 for spot and £4 for futures. At the lower basis, buying, especially for future positions, became more urgent, and the market closes steady at £227 10s. for spot and £226 5s. for three months.

Near-by material is becoming scarce in this market, where supplies seem to be well cornered. A premium of about one-quarter of a cent for spot tin has been established. Buying has been of a hand-to-mouth character, and the close is steady at about 50⅛c. per lb. for October delivery.

Visible stocks of tin on Sept. 30, are reported as follows: Great Britain, 6482; Holland, 2483; United States, excluding Pacific ports, 4280; total, 13,245 long tons, an increase of 1960 tons over the Aug. 31 report.

Shipments of tin from the Straits, eight months ended Aug. 31, were 34,807 long tons in 1911, and 38,466 in 1912; increase, 3659 tons.

Tin production of Federated Malay States eight months ended Aug. 31 was 28,669 long tons in 1911, and 31,329 in 1912; increase, 2660 tons.

Lead—The market is unchanged at 5.10c., New York. Offerings of Missouri lead have been more liberal, and slightly lower prices have been accepted in St. Louis, where quotations range between 4.90 and 4.95 cents.

The situation in the foreign market has relaxed considerably and larger quantities of lead are available. In consequence, a sharp decline took place, the close being cabled at £21 5s. for Spanish lead, and 2s. 6d. higher for English.

Spelter—Compared with the activity of recent weeks, the market has been rather dull. Consumers appear to have supplied their near-by wants and are not in a hurry to anticipate their requirements. On the other hand, there is not much pressure to sell because the production of spelter during the coming months may be greatly curtailed on account of the failing gas supply in Oklahoma and Kansas. However, it is reported that a further consignment of European spelter is on the way to this market. The close is somewhat lower at 7.30@7.35c. St. Louis, and 7.45@7.50c. New York.

The foreign market, due to purchases for this country, has experienced a further advance, and the close is cabled firm at £27 10s. for good ordinaries, and £27 15s. for specials.

Base price of zinc sheets was advanced 10c. on Sept. 25, and is now $9 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted 7¾c. per lb., New York.

Other Metals

Aluminum—Sales are good and prices have advanced sharply. Sales are reported made as high as 27c. We quote 26@26½c. per lb. for No. 1 ingots, New York. The foreign market is strong.

Antimony—The market is strong and prices have again advanced. Cookson's is quoted 10⅛c. per lb. and Hallett's, 9¼@9½c.; while 9@9⅜c. is named for Chinese, Hungarian and other outside brands.

Messrs. Edward Hill's Sons & Co., New York, write, on Oct. 1: "While the demand for antimony is good, the present advance is in no sense due to the demand, but to a scarcity of antimony ore. The ore has never been found in large quantities, nor mined over a long period of time in any one country. At one time Turkey, at another time Algeria and at another time Portugal supplied the world and in each instance as the deposits in these countries gave out, the market advanced and continued high until new deposits were found elsewhere. During the last 15 years China has been, by far the largest producer, but the present indications are that these deposits are now exhausted. We believe history will repeat itself, and that we shall see a high antimony market until some country is found to take the place of China as a producer of antimony ore."

Quicksilver—The market is steady, and prices here are unchanged. New York quotations are $42 per flask of 75 lb., with 60c. per lb. for retail lots. San Francisco, $41.50 for domestic orders and $39 for export. The London price is £8 per flask, with £7 17s. 6d. quoted from second hands.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 28—A premium price of $63 was paid for zinc ore; the base price of 60% zinc was $62 per ton. The base price paid for 80% lead ore was $62@64 per ton.

SHIPMENTS, WEEK ENDED SEPT. 28

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	641,600	.....	.....
Platteville	517,700	.....	144,000
Shullsburg	470,000	.....	.....
Benton	344,500	67,400	360,000
Hazel Green	334,000	60,000	.....
Highland	257,200	.....	.....
Harker	233,330	.....	.....
Galena	227,900	.....	.....
Dodgeville	200,000	.....	.....
Cuba City	81,000	.....	.....
Linden	62,010	.....	.....
Total	3,369,240	127,400	504,000
Year to date	151,638,810	6,204,660	26,215,210

Shipped during week to separating plants, 3,105,990 lb. zinc ore.

Joplin, Mo., Sept. 28—The highest price paid for zinc-sulphide ore was $67, the base per ton of 60% zinc $57@64. Zinc silicate sold on a base price of $30@34 per ton of 40% zinc. The average price all grades of zinc is $60.40. Some offers of a $65 base were made on Thursday, but sellers declined, hoping for lively competition on Friday, and a higher price, but buyers found little competition and dropped their offerings to $64. The high price of lead is $68, on a net base price of $65@67 per ton of 80% metal

SHIPMENTS, WEEK ENDED SEPT. 28

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,368,200	.....	1,604,960	$167,571
Joplin	2,939,090	.....	342,920	105,025
Duenweg	907,470	.....	120,280	31,979
Alba-Neck	843,530	.....	60,600	28,509
Miami	548,570	.....	329,260	26,436
Galena	436,090	.....	51,200	15,132
Cave Springs	445,950	.....	.....	14,270
Oronogo	409,030	.....	.....	8,938
Carl Junction	263,540	.....	.....	8,828
Spurgeon	59,830	307,350	49,030	8,785
Carthage	233,660	.....	.....	6,775
Jackson	168,830	.....	.....	5,065
Granby	.....	194,330	10,590	4,000
Quapaw	131,010	.....	.....	3,930
Sarcoxie	53,000	124,970	.....	3,608
Wentworth	64,590	38,280	.....	2,485
Lawton	60,160	.....	.....	2,045
Badger	20,810	.....	.....	624
Totals	11,953,360	664,930	1,968,840	$444,005
9 mos	412,758,360	25,600,990	70,027,140	$13,285,212

Blende val., the week, $369,153; 9 mos., $10,920,549
Calamine, the week, 11,966; 9 mos., 395,577
Lead value, the week, 62,886; 9 mos., 1,969,086

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	55.88	38.18	54.38	56.49	55.01
July	40.75	58.85	38.36	56.59	58.81	58.83
August	42.50	55.13	41.28	53.27	60.74	57.04
September	42.63	59.75	41.29	57.07	59.33	61.26
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.22	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

content. The average price, all grades, is $63.80 per ton.

Of a total of approximately 3200 tons stock in the bins there is more unsold ore tonight than for many months, perhaps 1000 to 1200 tons.

Chemicals

New York, Oct. 2—The general market is rather quieter than it has been.

Arsenic—The position continues strong. Prices are $4.75@5 per 100 lb. and are firm.

Copper Sulphate—Business is active and sales are increasing. Prices are unchanged at $5.50 per 100 lb. for carload lots, and $5.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is steady and prices are unchanged. Spot nitrate is 2.55c. per lb., while 2.57½c. per lb. is named for October-January deliveries.

CURRENT WHOLESALE PRICES

Ammonium sulphate	cwt.	3.25@3.28
Arsenic, white	lb.	0.04¼@0.05
Barytes, ground	sh. ton	12.50@14.00
" floated	sh. ton	16.00@17.00
Calcium acetate, gray	cwt.	2.50@2.55
carbide, tons lot f.o.b. Niagara Falls	sh. ton	70.00
Carbons, good drill quality	carat	85.00
Cement, Port., Am.	400-lb. bbl.	1.33
Chrome brick, f.o.b., Pittsburg	M.	175.00
ore, 50%, ex-ship, N. Y.,	lg. ton	14.00@16.00
Copperas, bulk	cwt.	0.55
bbl.	cwt.	0.65@0.85
Copper sulphate	cwt.	5.50@5.75
Fluorspar, lump, f.o.b. Pittsburg	ton	8.00@9.00
Magnesite, crude, 95%	lg. ton	10.00@11.00
calcined, powdered		30.00@35.00
brick, dom., f.o.b. Pittsburg	M.	160@180
Paints, litharge, Am. powd.	lb.	0.07@0.07½
red lead, American	lb.	0.07@0.07½
white lead, Am., dry	lb.	0.05½@0.06¼
zinc white, Am., dry	lb.	0.05½@0.06¼
Phosphates, acid:		
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75
Potassium cyanide, 95@96%	lb.	0.24
Pyrite:		
Domestic, non-arsenical, furnace size, f.o.b. R.R. per unit		0 12@0.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		0.11½@0.12
Imported, non-arsenical, furnace size, ex-ship, per unit		0.13½
Imported, arsenical, furnace size, ex-ship, per unit		0.12½@0.13
Imported, fines, arsenical, ex-ship		0.11@0.12
Imported, fines, non-arsenical, ex-ship, per unit		0.12½
Sodium cyanide, 120 to 130% KCN (per 100%)	lb.	0.21
nitrate 95% spot	cwt.	2.55
95% future	cwt.	2.57½
Sulphur, Louisiana prime, N. Y.,	lg. ton	22.00@22.50
roll	cwt.	1.85@2.15
flour	cwt.	2.00@2.40
flowers, sublimed	cwt.	2.20@2.60
pow. com., bags	cwt.	1.50
Sicilian, crude brimstone	lg. ton	22.50
Zinc chloride, granular	lb.	0.04½@0.04½

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S.C.

Note—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in their selling output on private contract.

Petroleum

Production of petroleum in California in August is reported at 7,694,442 bbl.; deliveries, 7,314,213 bbl.; stocks at close of month, 45,402,689 bbl. During August there were 82 new wells completed; on Aug. 31 there were 412 wells drilling.

Mining Stocks

New York, Oct. 2—On Sept. 26 the Exchange was steady and moderately active. Mining stocks on the Curb were fairly active.

Sept. 27 business on the Exchange increased, notwithstanding higher rates for money. On the Curb mining stocks were in some demand, but prices were irregular.

Sept. 28 the Exchange was firm, though the volume of business was moderate. Mining stocks on the Curb were dull and irregular.

Sept. 30 there were sharp advances on the Exchange, followed by a slight reaction. On the Curb copper stocks were in some demand, but most of them eased off a fraction. Other mining stocks were rather quiet, but steady.

The check to speculation due to high call money on Oct. 1 and 2 was aided by the unsettled state of the European markets on account of the disturbances in the East. The Exchange was weak and irregular. On the Curb copper stocks were in small demand at fractional declines, while other mining stocks were dull and rather weaker.

Boston, Oct. 1—There is less activity in the metal-share market, due in a measure to the tightening of money rates. Some stocks show moderate reactions, while others have made new price records for the year and in some cases for two years. The Dow failure has passed as a market factor, although these issues are naturally weak on the levying of a $2 assessment on Franklin mining shares and $1 on Indiana shares.

Franklin sought a low level at $6.75, but has recovered fractionally, and Indiana went down $11.12½, recovering $1. North Lake broke over $2 to $2.87½ and Algomah $1.50 to $3.50. By Mr. Dow's action, the treasuries of these companies were depleted by a sum said to be about $300,000 all told. Calumet & Hecla rose $55 to $615, the highest for two years. Osceola is up $3.50 to $116. This company has changed its dividend payments from semi-annual to quarterly, although maintaining the yearly rate of $12.

East Butte has been conspicuous, advancing $1.75 to $16.87½. Some new financing is contemplated by this company, which accounts for this rise, together with the fact that the company is now earning close to $3 per share yearly, and is in rich territory. Shattuck & Arizona has advanced $8 to $30, and American Zinc spurted $3.25 to $34.75. U. S. Smelting common is up $5.25 to $51, ex-dividend. The company has increased its payments from 50 to 75c. quarterly.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

Company	June	July	August
Alaska shipments	4,134,569	2,224,441	1,242,836
Anaconda	22,750,000	23,000,000	25,250,000
Arizona, Ltd.	3,300,000	3,200,000	3,260,000
Copper Queen	7,622,730	7,708,147	8,040,424
Calumet & Ariz.	4,160,000	4,748,000	4,514,000
Chino	1,474,979	2,945,000	3,437,309
Detroit	1,959,634	2,194,090	1,882,289
East Butte	1,267,343	1,261,304	1,410,500
Mammoth	1,849,953	1,818,738	1,802,590
Mason Valley	1,438,580	1,500,000	.....
Nevada Con.	5,913,832	6,084,274	.....
Ohio	665,000	617,500	.....
Old Dominion	2,130,000	2,543,763	2,620,000
Ray	3,004,195	2,985,965	2,888,095
Shannon	1,270,000	1,446,000	1,400,000
South Utah	162,335	142,555	224,855
United Verde*	2,500,000	2,500,000	2,500,000
Utah Copper Co.	8,772,742	10,602,000	11,248,992
Lake Superior*	15,600,000	19,500,000	21,000,000
Non-rep. mines*	8,300,000	8,970,000	8,970,000
Total production	98,275,992	105,991,687	.....
Imports, bars, etc.	24,262,292	25,586,735	.....
Total blister	122,538,184	131,578,422	.....
Imp. in ore & matte	8,404,936	7,748,392	.....
Total American	130,943,120	139,326,814	.....
Miami†	2,683,310	3,027,710	3,048,750
Brit. Col. Cos.:			
British Col. Copper	996,000	1,026,000	.....
Granby	1,888,400	1,802,753	1,970,388
Mexican Cos.:			
Boleo†	1,851 920	2,386,480	.....
Cananea	4,310,000	4,000,000	4,044,000
Moctezuma	3,176,819	3,094,016	3,229,839
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Kyshtim, Russia	.....	1,325,000	.....
Spassky, Russia	757,120	795,200	902,720
Famatina, Argen.	.....	.....	.....
Tilt Cove, Newf'd.	.....	.....	.....
Exports from:			
Chile	9,856,000	8,960,000	8,512,000
Australia	8,176,000	8,288,000	8,064,000
Arrivals in Europe‡	12,607,200	14,114,240	20,200,320

†Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

‡Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	U.S. Refin'y Product'n	Deliveries, Domestic	Deliveries for Export
IX, 1911	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167,904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53,252,326
V	126,737,836	72,702,277	69,485,945
VI	122,315,240	66,146,229	61,449,650
VII	137,161,129	71,094,381	60,121,331
VIII	145,628,521	78,722,418	70,485,150
IX	.....	.....	.....

VISIBLE STOCKS

	United States	Europe	Total
X, 1911	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,387
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243
VII	44,335,004	108,186,000	152,521,004
VIII	50,280,421	113,299,200	163,579,621
IX	46,701,374	113,568,000	160,269,374
X	.....	107,408,000	.....

Curb trading has been of good volume and prices maintain a strong tone. Alaska Gold touched $10. Corbin Copper, another Dow promotion, touched 15c., with heavy transactions in it. Nevada Douglas is also strong.

Assessments

Company	Delinq	Sale	Amt
Andes, Nev.	Sept. 26	Oct. 17	$0.05
Black Bear, Ida.	Sept. 26	Oct. 26	0.01
Black Horse, Ida.	Oct. 18	Nov. 8	0.01
Black Jack, Utah.			0.01½
Bullion, Nev.	Oct. 16	Nov. 6	0.03
Columbus Extension, Utah.	Sept. 30	Oct. 23	0.02½
Eagle Mt., Ida.	Sept. 23	Oct. 23	0.00½
Eastern Star, Ida.	Oct. 12	Nov. 12	0.002
Empire, Ida.	Sept. 23	Oct. 23	0.002
Great Eastern, Ida.	Sept. 28	Oct. 28	0.002½
Hale & Norcross, Nev.	Oct. 3	Oct. 4	0.05
Hypotheek, Ida.	Oct. 14	Nov. 4	0.01
Indiana, Mich.	Oct. 16		1.00
Little Butte, Ida.	Sept. 21	Oct. 1	0.001
Michigan Cop. & Gold, Utah	Oct. 2	Oct. 22	0.00¼
Oneco, Mich.	Oct. 10		1.00
Savage, Nev.	Oct. 2	Oct. 24	0.10
Seg. Belcher, Nev.	Oct. 4	Oct. 25	0.02
Sierra-Nevada, Nev.	Sept. 25	Oct. 16	0.05
Snowshoe, Ida.	Sept. 30	Oct. 30	0.005
Temple, Ida.	Sept. 30	Oct. 30	0.002
Twin Star, Ida.	Aug. 31	Sept. 28	0.02
Union Con., Nev.	Oct. 15	Nov. 6	0.15
Wabash, Utah	Sept. 16	Oct. 10	0.05
Wasatch, Utah	Sept. 27	Oct. 16	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	61.290	24.651	24.486	28.215
July	54.150	52.630	60.654	25.034	24.286	27.919
August	52.912	52.171	61.606	24.428	24.082	28.375
September	53.295	52.440	63.078	24.567	24.209	29.088
October	55.490	53.340		25.596	24.594	
November	55.635	55.719		25.680	25.649	
December	54.428	54.905		25.160	25.349	
Year	53.486	53.304		24.670	24.592	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	17.234	12.611	17.443	56.365	78.259
July	12.463	17.190	12.720	17.353	56.673	76.636
August	12.405	17.498	12.634	17.644	56.266	78.670
September	12.201	17.508	12.508	17.698	55.253	78.762
October	12.189		12.370		55.170	
November	12.616		12.769		57.253	
December	13.552		13.768		62.068	
Year	12.376		12.634		55.973	

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	44.519
February	41.614	42.962	August	43.319	45.857
March	40.157	42.577	September	39.755	49.135
April	42.185	43.923	October	41.185	
May	43.115	46.053	November	43.125	
June	44.606	45.815	December	44.655	
			Av. Year	42.281	

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.331
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	4.392	4.292	4.321	13.260	17.588
July	4.499	4.720	4.397	4.603	13.530	18.544
August	4.500	4.569	4.406	4.452	14.260	19.679
September	4.485	5.048	4.356	4.924	14.744	22.292
October	4.265		4.139		15.332	
November	4.298		4.181		15.821	
December	4.450		4.332		15.648	
Year	4.420		4.286		13.970	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	6.877	5.370	6.727	24.612	25.763
July	5.695	7.116	5.545	6.966	25.006	26.174
August	5.953	7.028	5.803	6.878	26.801	26.443
September	5.869	7.454	5.719	7.313	27.750	27.048
October	6.102		5.951		27.256	
November	6.380		6.223		26.795	
December	6.301		6.151		26.849	
Year	5.758		5.608		25.281	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	15.15	14.06	14.11	14.56	14.22
July	15.90	15.15	14.03	14.38	14.53	14.38
August	15.90	15.43	14.00	14.90	14.47	14.85
September	15.90		13.57		14.40	
October	15.43		13.44		14.34	
November	14.92		13.30		14.25	
December	15.15		13.10		13.90	
Year	$15.72		$13.94		$14.49	

STOCK QUOTATIONS

COLO. SPRINGS Oct. 1

Name of Comp.	Bid.
Acacia	.04½
Cripple Cr'k Con.	.01½
C. K. & N.	.17½
Doctor Jack Pot.	.06
Elkton Con.	.65
El Paso	1.16
Findlay	.05
Gold Dollar	.18
Gold Sovereign	.02½
Isabella	.19½
Jack Pot	.05
Jennie Sample	.07
Lexington	‡ .007
Moon Anchor	.007
Old Gold	.03½
Mary McKinney	.73
Pharmacist	.005
Portland	1.04
Vindicator	.86
Work	.01

SALT LAKE Oct. 1

Name of Comp.	Bid.
Beck Tunnel	.08½
Black Jack	.08½
Cedar Talisman	.01
Colorado Mining	.14
Columbus Con.	.10
Crown Point	.02
Daly-Judge	5.80
Grand Central	.62
Iron Blossom	1.20
Little Bell	.20
Lower Mammoth	.06
Mason Valley	12.50
May Day	.15
Nevada Hills	‡1.75
New York	.02½
Prince Con	1.65
Silver King Coal'n	2.85
Sioux Con.	.04½
Uncle Sam	.10
Yankee	.12

TORONTO Oct. 1

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.40	Hollinger	13.90
Hudson Bay	60.00	Imperial	.02½
Temiskaming	.38	Pearl Lake	.24
Wettlaufer-Lor.	.44	Porcu. Gold	.25
Am. Goldfield	.50	Porcu. Tisdale	‡.01
Apex	.02	Preston E. D.	.02
Crown Chartered	.07	Rea	.24
Dobie	‡ .20	Standard	.00½
Dome Exten.	.14	Swastika	.11
Foley O'Brien	.14	West Dome	.05

SAN FRANCISCO Oct. 1

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.31
Best & Belcher	.04
Caledonia	1.60
Challenge Con.	.06
Chollar	.03
Confidence	.35
Con. Virginia	.36
Crown Point	.30
Gould & Curry	.01
Hale & Norcross	.11
Mexican	2.42½
Occidental	.70
Ophir	.52
Overman	.75
Potosi	.03
Savage	.11
Sierra Nevada	.17
Union Con.	.38
Yellow Jacket	.27

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	9.75
Jim Butler	.79
MacNamara	.22
Midway	.54
Mont.-Tonopah	2.35
North Star	.30
West End Con.	1.67½
Atlanta	.20
Booth	.05
C.O.D. Con.	.08
Comb. Frac.	.12
Jumbo Extension	.33
Pitts.-Silver Peak	.96
Silver Pick	.09
St. Ives	‡.30
Tramp Con.	‡.04
Argonaut	‡2.25
Bunker Hill	‡4.50
Central Eureka	‡.30
So. Eureka	‡2.90

N. Y. EXCH. Oct. 1

Name of Comp.	Clg.
Amalgamated	90⅞
Am. Agri. Chem.	59
Am.Sm.&Ref.,com	89⅛
Am. Sm. & Ref., pf.	109
Am. Sm. Sec., pf. B	86¾
Anaconda	46½
Batopilas Min.	1⅝
BethlehemSteelpf	79¼
Chino	43⅜
Federal M. & S., pf.	48
Goldfield Con.	2⅝
GreatNor.,ore.,ctf.	51¼
Guggen. Exp.	59
Homestake	99
Inspiration Con.	19⅜
Miami Copper	29¾
Nat'nalLead,com.	65
National Lead, pf.	108½
Nev. Consol.	23⅛
Phelps Dodge	215½
Pittsburg Coal, pf.	97¾
Ray Con.	33⅛
RepublicI&S.com.	33¾
Republic I & S, pf.	92
SlossSheffi'd.com.	58⅜
Sloss Sheffield, pf.	100
Tennessee Copper	45½
Utah Copper	65¾
U. S. Steel, com	79
U. S. Steel, pf.	116¼
Va. Car. Chem.	46⅞

N. Y. CURB Oct. 1

Name of Comp.	Clg.
Barnes King	‡ 78
Beaver Con.	.40
Braden Copper	7
B. C. Copper	5
Buffalo Mines	1⅛
Caledonia	25
Con. Ariz. Sm.	5/8
Davis-Daly	2⅛
Diam'field-Daisy	6
Ely Con.	23
Florence	82
Giroux	4⅞
Gold Hill Con.	1/8
Greene Cananea	10
Greenwater	05
Internat. S. & R.	‡124
Kerr Lake	2⅛
Keystone	2
La Rose	2⅜
McKinley-Dar-Sa.	1⅞
Min. Co of A. new	27/8
Motherlode Gold.	‡1⅛
Nev. Utah M. & S.	‡ .01
Nipissing Mines	8⅝
Ohio Copper	1¼
Pacific Sm. & M	3/32
South Live Oak	1
South Utah M. & S.	5/8
Standard Oil (Old)	1050
Stand'd Oil of N.J.	408
Stand'd Oil Subs.	‡680
Stewart	1⅜
Tonopah	6⅝
Tonopah Ex.	1¼
Tri-Bullion	7/8
Tularosa	⅛
Union Mines	‡⅛
United Cop., pfd.	8
Yukon Gold	3⅜

LONDON Oct. 2

Name of Com	Clg.
Camp Bird	£1 7s 6d
Dolores	1 10 0
El Oro	0 15 6
Esperanza	1 17 0
Mexico Mines	7 0 0
Oroville	0 5 3
Stratton'sInd.	0 3 1½
Tomboy	1 6 0

BOSTON EXCH. Oct. 1

Name of Comp.	Clg.
Adventure	7
Ahmeek	349
Algomah	3½
Allouez	46½
Am. Zinc	34
Ariz. Com., ctfs.	4⅝
Bonanza	‡ 40
Boston & Corbin	7⅜
Butte & Balak	‡3½
Calumet & Ariz.	82
Calumet & Hecla	609
Centennial	21½
Cliff	5
Copper Range	59
Daly West	4¼
East Butte	16⅝
Franklin	7½
Granby	58⅞
Hancock	‡26⅛
Hedley Gold	.20
Helvetia	.90
Indiana	12½
Island Cr'k, com.	‡54
Island Cr'k, pfd.	‡88
Isle Royale	35½
Keweenaw	‡1
Lake	35¼
La Salle	5⅜
Mass	‡7¼
Michigan	2
Mohawk	67
New Arcadian	3
New Idria Quick.	‡7⅛
North Butte	34⅛
North Lake	3¾
Ojibway	4
Old Dominion	62⅛
Osceola	114
Quincy	‡89¼
Shannon	16
Shattuck-Ariz.	29½
Superior	48⅝
Superior & Bost.	1¼
Tamarack	‡43
Trinity	5⅜
Tuolumne	2⅛
U. S. Smelting	49½
U. S. Smelt'g, pf.	51¾
Utah Apex	2⅛
Utah Con.	12
Victoria	2¾
Winona	5
Wolverine	78¼
Wyandot	‡2

BOSTON CURB Oct. 1

Name of Comp.	Last
Alaska Gold M.	9½
Bingham Mines	5½
Boston Ely	1⅛
Boswyocolo	.02
Butte Central	7
Cactus	.12
Calaveras	2⅛
Chief Cons	1⅛
Corbin	.23
Cortez	.80
Crown Reserve	3½
First Nat. Cop.	2
Majestic	.47
Mazatan	‡⅛
Moneta Porc.	‡.03
Nevada-Douglas	3⅛
New Baltic	2⅛
Oneco	1
Raven Copper	.27
Rhode IslandCoal	.10
San Antonio	‡3
S. W. Miami	5
South Lake	7½
Trethewey	‡.30
United Verde Ext.	.40
Vulture	‡5

‡Last quotation.